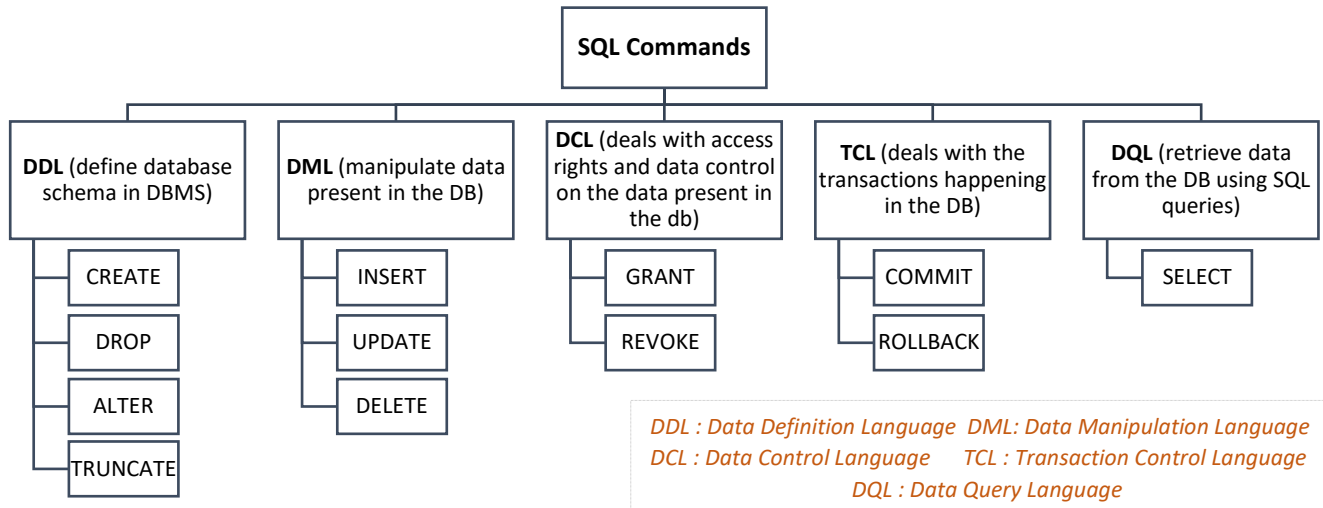




Structured Query language (SQL)



| | |
|---|---|
| 1. Create database | <code>create database sample2</code> |
| 2. Use the database | <code>use sample2</code> |
| 3. Create table | <pre> create table customer (customerid int identity(1,1) primary key, customernumber int not null unique check (customernumber>0), lastname varchar(30) not null, firstname varchar(30) not null, areacode int default 71000, address varchar(50), country varchar(50) default 'Malaysia') </pre> |
| 4. Insert values into table | <pre> insert into customer values (100,'Fang Ying','Sham','418999','sdadasfd',default), (200,'Mei Mei','Tan',default,'adssdsadsd','Thailand'), (300,'Albert','John',default,'dfdsfsdf',default) </pre> |
| 5. Display record from table | <pre> -- display all records select * from customer -- display particular columns select customerid, customernumber, lastname, firstname from customer </pre> |
| 6. Add new column to table | <pre> alter table customer add phonenummer varchar(20) </pre> |
| 7. Add values to newly added column/ Update table | <pre> update customer set phonenummer='1234545346' where customerid=1 update customer set phonenummer='45554654' where customerid=2 </pre> |
| 8. Delete a column | <pre> alter table customer drop column phonenummer </pre> |
| 9. Delete record from table --if not put 'where', will delete all record | <pre> delete from customer where country='Thailand' </pre> |
| 10. Delete table | <code>drop table customer</code> |
| 11. Change data type | <pre> alter table customer alter column phonenummer varchar(10) </pre> |



| | |
|----------------------------|--|
| 1. Create database | <code>create database SaleOrder</code> |
| 2. Use the database | <code>use SaleOrder</code> |
| 3. Create tables | <pre> create table dbo.customer (CustomerID int NOT null primary key, CustomerFirstName varchar(50) NOT null, CustomerLastName varchar(50) NOT null, CustomerAddress varchar(50) NOT null, CustomerSuburb varchar(50) null, CustomerCity varchar(50) NOT null, CustomerPostCode char(4) null, CustomerPhoneNumber char(12) null,); create table dbo.inventory (InventoryID tinyint NOT null primary key, InventoryName varchar(50) NOT null, InventoryDescription varchar(255) null,); create table dbo.employee (EmployeeID tinyint NOT null primary key, EmployeeFirstName varchar(50) NOT null, EmployeeLastName varchar(50) NOT null, EmployeeExtension char(4) null,); create table dbo.sale (SaleID tinyint not null primary key, CustomerID int not null references customer(CustomerID), InventoryID tinyint not null references Inventory(InventoryID), EmployeeID tinyint not null references Employee(EmployeeID), SaleDate date not null, SaleQuantity int not null, SaleUnitPrice smallmoney not null); </pre> |
| 4. Check what table inside | <code>select * from information_schema.tables</code> |
| 5. View specific row | <pre> --top: show only the first two select top 2 * from customer --top 40 percent: also means show the first two select top 40 percent * from customer </pre> |
| 6. View specific column | <pre> --sort result (by default is ascending) select customerfirstname, customerlastname from customer order by customerlastname desc select customerfirstname, customerlastname from customer order by 4, 2, 3 desc -- Order By Based on column no. without typing column name --distinct: only show unique value select distinct customerlastname from customer order by customerlastname </pre> |



| | |
|--------------------------------|--|
| 7. Save table to another table | --into file_name: save result in another table (BASE TABLE) select distinct customerlastname into temp from customer order by customerlastname select * from temp --see the table (data type will remain) |
| 8. Like (search something) | -- (underscore sign) _ is only specific for one character only -- (percent sign) % represents zero, one, or multiple characters select * from customer where customerlastname like '_r%' |
| 9. In (search something) | -- search multiple items select * from customer where customerlastname in ('Brown', 'Michael', 'Jim') |
| 10. > (search something) | select * from customer where customerlastname > 'Brown' or customerlastname > 'Cross' |
| 11. <> (Not Equal) | select * from customer where customerlastname <> 'Brown' |
| 12. IS NULL | -- check null values select * from customer where customerlastname IS NULL |
| 13. IS NOT NULL | select * from customer where customerlastname IS NOT NULL |
| 14. between | select * from sale where saleunitprice between 5 and 10 --not include 5 & 10 |
| 15. count | -- returns the number of rows in a table -- AS means aliasing, temporary giving name to a column/ table select count(*) as [Number of Records] from customer where customerfirstname like 'B%' |
| 16. sum | select sale.employeeid, EmployeeFirstName, EmployeeLastName, count(*) as [Number of order], sum(salequantity) as [Total Quantity] from sale, employee where sale.employeeid = employee.employeeid group by sale.employeeid, EmployeeFirstName, EmployeeLastName |
| 17. count month | select month(saledate) as [Month], count(*) as [Number of sale], sum(salequantity*saleunitprice) as [Total Amount] from sale group by month(saledate) |
| 18. max | SELECT MAX(Salary) FROM EmployeeSalary |
| 19. min | SELECT MIN(Salary) FROM EmployeeSalary |
| 20. average | SELECT AVG(Salary) FROM EmployeeSalary |



| 21. having | <pre>SELECT JobTitle, COUNT(JobTitle) FROM EmployeeDemographics ED JOIN EmployeeSalary ES ON ED.EmployeeID = ES.EmployeeID GROUP BY JobTitle HAVING COUNT(JobTitle) > 1 SELECT JobTitle, AVG(Salary) FROM EmployeeDemographics ED JOIN EmployeeSalary ES ON ED.EmployeeID = ES.EmployeeID GROUP BY JobTitle HAVING AVG(Salary) > 45000 ORDER BY AVG(Salary)</pre> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----------|-----------|----------|-------------|--------|-------------|---|-----|---------|--------|-------|---|---|--------|--------|--------|-------|---|---|----------|--------|--------|-------|---|---|---------|--------|------|-------|---|---|-------|--------|------|-------|---|---|---------|-------|------|-------|---|---|--------|---------|------|-------|---|---|-----|---------|------|-------|---|
| 22. Change data type temporary for use | <pre>-- CAST(expression AS datatype(length)) SELECT CAST('2017-08-25 00:00:00.000' AS date) -- CONVERT(data_type(length), expression, style) SELECT CONVERT(date, '2017-08-25 00:00:00.000')</pre> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23. CASE Statement | <pre>SELECT FirstName, LastName, Age, CASE WHEN Age > 30 THEN 'Old' WHEN Age BETWEEN 27 AND 30 THEN 'Young' ELSE 'Baby' END FROM EmployeeDemographics ED WHERE Age IS NOT NULL ORDER BY Age -- SELECT FirstName, LastName, JobTitle, Salary, CASE WHEN JobTitle = 'Salesman' THEN Salary + (Salary *.10) WHEN JobTitle = 'Accountant' THEN Salary + (Salary *.05) WHEN JobTitle = 'HR' THEN Salary + (Salary *.000001) ELSE Salary + (Salary *.03) END AS SalaryAfterRaise FROM EmployeeDemographics ED JOIN EmployeeSalary ES ON ED.EmployeeID = ES.EmployeeID</pre> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24. Partition By --returns a single value for each row | <pre>SELECT FirstName, LastName, Gender, Salary, COUNT(Gender) OVER (PARTITION BY Gender) AS TotalGender FROM EmployeeDemographics ED JOIN EmployeeSalary ES ON ED.EmployeeID = ES.EmployeeID</pre> <table><tr><th></th><th>FirstName</th><th>LastName</th><th>Gender</th><th>Salary</th><th>TotalGender</th></tr><tr><td>1</td><td>Pam</td><td>Beasley</td><td>Female</td><td>36000</td><td>3</td></tr><tr><td>2</td><td>Angela</td><td>Martin</td><td>Female</td><td>47000</td><td>3</td></tr><tr><td>3</td><td>Meredith</td><td>Palmer</td><td>Female</td><td>41000</td><td>3</td></tr><tr><td>4</td><td>Stanley</td><td>Hudson</td><td>Male</td><td>48000</td><td>5</td></tr><tr><td>5</td><td>Kevin</td><td>Malone</td><td>Male</td><td>42000</td><td>5</td></tr><tr><td>6</td><td>Michael</td><td>Scott</td><td>Male</td><td>65000</td><td>5</td></tr><tr><td>7</td><td>Dwight</td><td>Schrute</td><td>Male</td><td>63000</td><td>5</td></tr><tr><td>8</td><td>Jim</td><td>Halpert</td><td>Male</td><td>45000</td><td>5</td></tr></table> | | FirstName | LastName | Gender | Salary | TotalGender | 1 | Pam | Beasley | Female | 36000 | 3 | 2 | Angela | Martin | Female | 47000 | 3 | 3 | Meredith | Palmer | Female | 41000 | 3 | 4 | Stanley | Hudson | Male | 48000 | 5 | 5 | Kevin | Malone | Male | 42000 | 5 | 6 | Michael | Scott | Male | 65000 | 5 | 7 | Dwight | Schrute | Male | 63000 | 5 | 8 | Jim | Halpert | Male | 45000 | 5 |
| | FirstName | LastName | Gender | Salary | TotalGender | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Pam | Beasley | Female | 36000 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Angela | Martin | Female | 47000 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Meredith | Palmer | Female | 41000 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Stanley | Hudson | Male | 48000 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Kevin | Malone | Male | 42000 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Michael | Scott | Male | 65000 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Dwight | Schrute | Male | 63000 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Jim | Halpert | Male | 45000 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



| | |
|----------------------|---|
| 25. String Functions | <pre> -- Remove space Select EmployeeID, TRIM(EmployeeID) AS IDTRIM FROM EmployeeErrors Select EmployeeID, RTRIM(EmployeeID) as IDRTRIM FROM EmployeeErrors Select EmployeeID, LTRIM(EmployeeID) as IDLTRIM FROM EmployeeErrors -- Replace Select LastName, REPLACE(LastName, '- Fired', '') as LastNameFixed FROM EmployeeErrors -- Substring Select Substring(err.FirstName,1,3), Substring(dem.FirstName,1,3), Substring(err.LastName,1,3), Substring(dem.LastName,1,3) FROM EmployeeErrors err JOIN EmployeeDemographics dem on Substring(err.FirstName,1,3) = Substring(dem.FirstName,1,3) and Substring(err.LastName,1,3) = Substring(dem.LastName,1,3) -- UPPER and LOWER CASE Select firstname, LOWER(firstname) from EmployeeErrors Select Firstname, UPPER(FirstName) from EmployeeErrors" </pre> |
| 26. Stored Procedure | <pre> CREATE PROCEDURE Temp_Employee @JobTitle nvarchar(100) AS DROP TABLE IF EXISTS #temp_employee Create table #temp_employee (JobTitle varchar(100), EmployeesPerJob int , AvgAge int, AvgSalary int) Insert into #temp_employee SELECT JobTitle, Count(JobTitle), Avg(Age), AVG(salary) FROM EmployeeDemographics emp JOIN EmployeeSalary sal ON emp.EmployeeID = sal.EmployeeID where JobTitle = @JobTitle --- make sure to change this in this script from original above group by JobTitle Select * From #temp_employee GO; </pre> |



```
--- only need to run this on next time
EXEC Temp_Employee @JobTitle = 'Salesman'
```

27. Subquery

```
-- Subquery in Select
SELECT EmployeeID, Salary, (SELECT AVG(Salary) FROM
EmployeeSalary) AS AllAvgSalary
FROM EmployeeSalary

-- with Partition By
SELECT EmployeeID, Salary, AVG(Salary) OVER () AS
AllAvgSalary
FROM EmployeeSalary
```

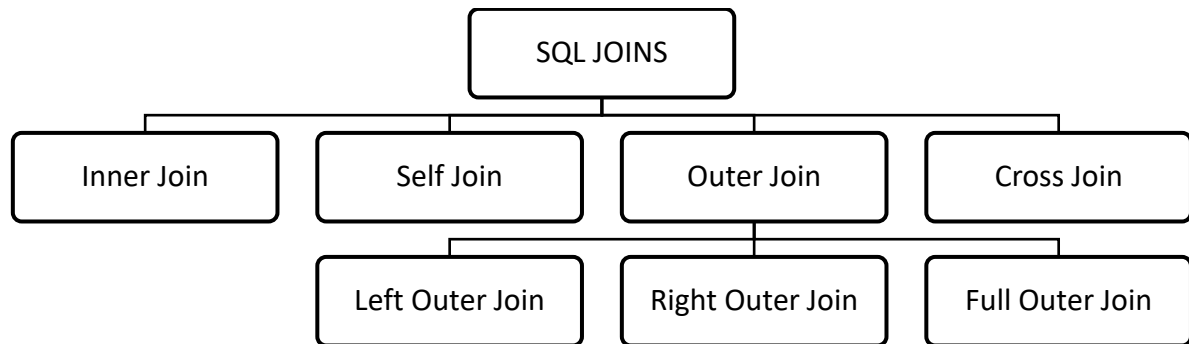
| | EmployeeID | Salary | AllAvgSalary |
|---|------------|--------|--------------|
| 1 | 1001 | 45000 | 47909 |
| 2 | 1002 | 36000 | 47909 |
| 3 | 1003 | 63000 | 47909 |
| 4 | 1004 | 47000 | 47909 |
| 5 | 1005 | 50000 | 47909 |

```
-- Subquery in From
SELECT a.EmployeeID, AllAvgSalary
FROM (SELECT EmployeeID, Salary, AVG(Salary) OVER () AS
AllAvgSalary
      FROM EmployeeSalary) a
ORDER BY a.EmployeeID
```

| | EmployeeID | AllAvgSalary |
|---|------------|--------------|
| 1 | NULL | 47909 |
| 2 | 1001 | 47909 |
| 3 | 1002 | 47909 |
| 4 | 1003 | 47909 |
| 5 | 1004 | 47909 |
| 6 | 1005 | 47909 |

```
-- Subquery in Where
SELECT EmployeeID, JobTitle, Salary
FROM EmployeeSalary
WHERE EmployeeID in (SELECT EmployeeID FROM
EmployeeDemographics
                    WHERE Age > 30)

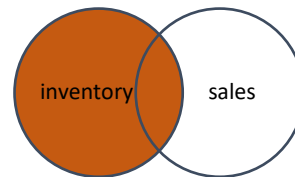
SELECT EmployeeID, JobTitle, Salary
FROM EmployeeSalary
WHERE Salary in (SELECT Max(Salary) FROM EmployeeSalary)
```



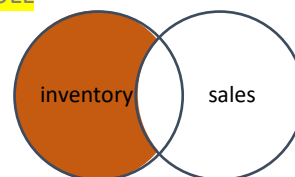
| | |
|--|---|
| 1. getting data from multiple tables (explicit join - without using join command) | <pre> select * from inventory,sale where sale.inventoryid=inventory.inventoryid select inventoryname,saledate,saleunitprice,salequantity,salequantity*saleunitprice as [Total amount] from sale,inventory where sale.inventoryid=inventory.inventoryid group by sale.inventoryid,inventoryname,saledate,salequantity,saleunitprice order by inventoryname </pre> |
| 2. getting data from multiple tables (implicit join - using join command) | <pre> --inner join select * from inventory inner join sale on sale.inventoryid=inventory.inventoryid select inventoryname,saledate,saleunitprice,salequantity,saleunitprice*salequantity as [Total Amount] from inventory inner join sale on sale.inventoryid=inventory.inventoryid order by inventoryname </pre> <div data-bbox="874 1361 1168 1541"> </div> <pre> --full outer join (shows everything) select sale.inventoryid,inventoryname from inventory full outer join sale on sale.inventoryid=inventory.inventoryid where sale.inventoryid is NULL </pre> <div data-bbox="874 1899 1168 2078"> </div> |



--left join (might have NULL value, since some inventory might not have sales)
 select inventory.inventoryid, inventoryname
 from inventory left join sale on
 sale.inventoryid=inventory.inventoryid

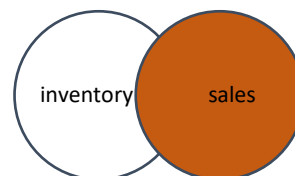


--left join
 select inventory.inventoryid, inventoryname
 from inventory left join sale on
 sale.inventoryid=inventory.inventoryid
 where sale.inventoryid is NULL



-- without join: use subquery
 select inventoryid, inventoryname from inventory
 where inventoryid not in (select inventoryid from sale)

--right join
 select sale.inventoryid, inventoryname
 from inventory right join sale on
 sale.inventoryid=inventory.inventoryid



3. Self Join
 --commonly used in processing
 hierarchy

--inner join
 Staff Table

| employeeID | employeefirstname | employeeelastname | managerID |
|------------|-------------------|-------------------|-----------|
| 1001 | Tan | Mei Ling | NULL |
| 1002 | Kelvin | Koh | 1001 |
| 1003 | Amin | Wong | 1002 |

select E.employeeID, E.employeefirstname+' '+E.employeeelastname as [Full Name], E.managerID, M.employeefirstname+' '+M.employeeelastname as [Manager Name]
 from staff E
 inner join staff M
 on E.managerID = M.employeeID



Output:

| employeeID | Full Name | managerID | managerName |
|------------|------------|-----------|--------------|
| 1002 | Kelvin Koh | 1001 | Tan Mei Ling |
| 1003 | Amin Wong | 1002 | Kelvin Koh |

--left outer join (list all the employees)

```
select E.employeeID, E.employeefirstname+' '+E.employeeelastname as [F
Name], E.managerID, , M.employeefirstname+' '+M.employeeelastname as
[Manager Name]
```

from staff E

left outer join staff M

on E.managerID = M.employeeID

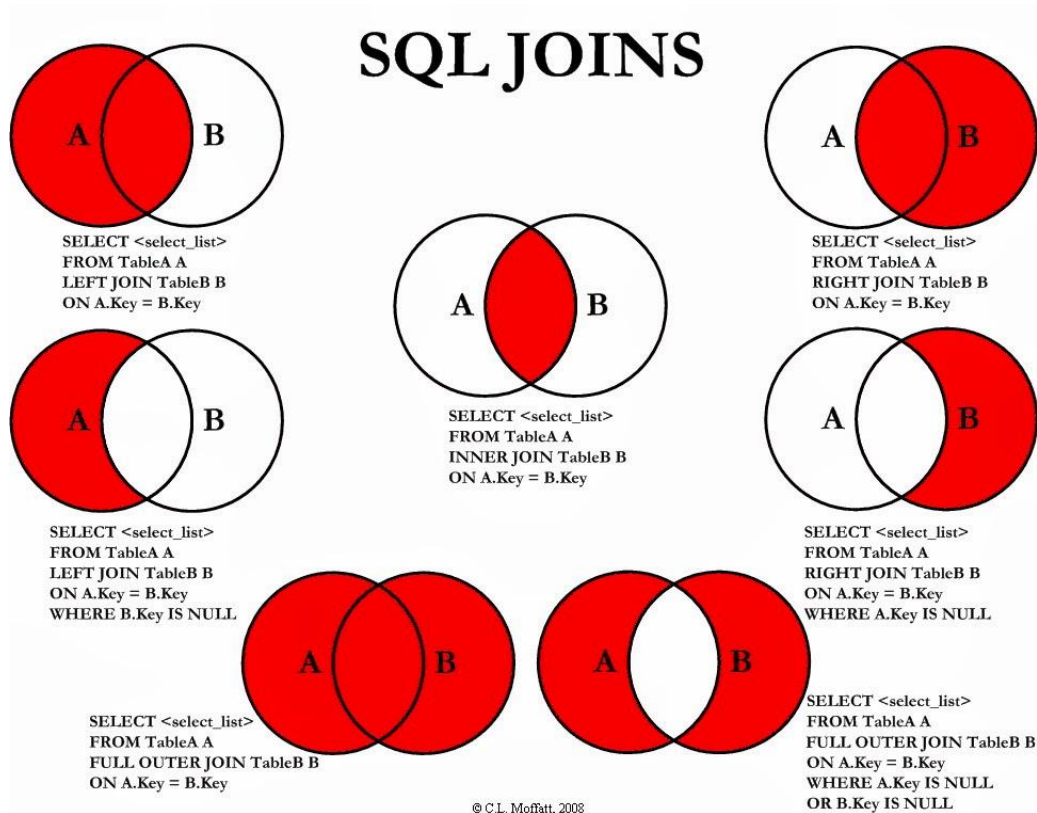
Output:

| employeeID | Full Name | managerID | managerName |
|------------|--------------|-----------|--------------|
| 1001 | Tan Mei Ling | | |
| 1002 | Kelvin Koh | 1001 | Tan Mei Ling |
| 1003 | Amin Wong | 1002 | Kelvin Koh |

4. Cross Join

--generate all combination of
records (all possibility)
(Cartesian Product)

```
select * from inventory1
cross join inventory2
```





SQL UNIONS

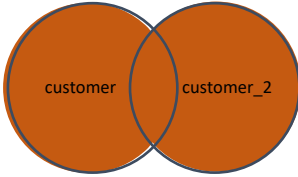
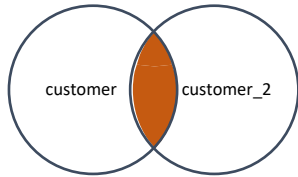
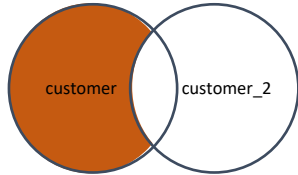
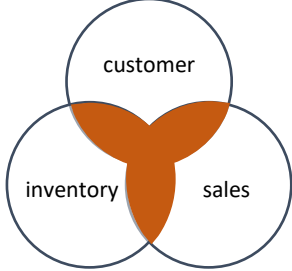
| | |
|---|--|
| <p>1. Union</p> <p>--allow you to combine two tables together (but the no. of columns & each column's data types for 2 tables must be match)</p> <p>--don't need common key, only need common attributes</p> <p>--merge, not showing duplicate record</p> | <pre>select cust_lname,cust_fname from customer union select cust_lname,cust_fname from customer_2</pre> |
| <p>2. Union all</p> <p>--merge, but show you everything, even the duplicate record</p> | <pre>select cust_lname,cust_fname from customer union all select cust_lname,cust_fname from customer_2</pre>  |
| <p>3. Intersect</p> <p>--keep only the rows in common to both query</p> <p>--not showing duplicate record</p> | <pre>select cust_lname,cust_fname from customer intersect select cust_lname,cust_fname from customer_2</pre>  <pre>select c.cust_lname,c.cust_fname from customer c,customer_2 c2 where c.cust_lname=c2.cust_lname and c.cust_fname=c2.cust_fname</pre> |
| <p>4. Except</p> <p>--generate only the records that are unique to the CUSTOMER table</p> | <pre>select cust_lname,cust_fname from customer except select cust_lname,cust_fname from customer_2</pre>  <pre>--use subquery select cust_lname,cust_fname from customer where(cust_lname) not in (select cust_lname from customer_2) and (cust_fname) not in (select cust_fname from customer_2)</pre> |



Table & View

| | |
|--|--|
| <p>1. view table (view will be updated when update base) --view is a result set of SQL statements, exists only for a single query</p> | <pre>create view CustomerView as select customerfirstname+' '+customerlastname as [Customer Name] , customerphonenumber, inventoryname,saledate,salequantity,saleunitprice,salequantity*saleunitprice as [Total Amount] from customer inner join sale on customer.customerid=sale.customerid inner join inventory on sale.inventoryid=inventory.inventoryid</pre>  |
| <p>2. Temp table (temp will NOT be updated when update base) --a single hashtag (#) sign must be added in front of their names --used to store data temporarily, physically created in the Tempdb database --can perform CRUD, join, and some other operations like the persistent database tables</p> | <pre>DROP TABLE IF EXISTS #temp_Employee Create table #temp_Employee (JobTitle varchar(100), EmployeesPerJob int, AvgAge int, AvgSalary int) Insert INTO #temp_Employee SELECT JobTitle, Count(JobTitle), Avg(Age), AVG(salary) FROM EmployeeDemographics emp JOIN EmployeeSalary sal ON emp.EmployeeID = sal.EmployeeID group by JobTitle SELECT * FROM #temp_Employee</pre> |
| <p>3. CTE (Common Table Expression) --create temporary result set which is used to manipulate the complex sub-queries data --created in memory rather than Tempdb database, so cannot create any index on CTE.</p> | <pre>WITH CTE_Employee AS (SELECT FirstName, LastName, Gender, Salary, COUNT(Gender) OVER (PARTITION BY Gender) AS TotalGender FROM EmployeeDemographics ED JOIN EmployeeSalary ES ON ED.EmployeeID = ES.EmployeeID WHERE Salary > '45000') SELECT FirstName, LastName, Gender, TotalGender FROM CTE_Employee WHERE TotalGender = (SELECT MIN(TotalGender) FROM CTE_Employee)</pre> |
| <p>4. Duplicate Table</p> | <pre>select customerfirstname+' '+customerlastname as [Customer Name] , customerphonenumber, inventoryname,saledate,salequantity,saleunitprice,salequantity*saleunitprice as [Total Amount] into customerRec from customer inner join sale on customer.customerid=sale.customerid inner join inventory on sale.inventoryid=inventory.inventoryid order by customerfirstname+' '+customerlastname,inventoryname</pre> |



SQL RANKS

1. ROW_NUMBER()

--get a unique sequential number for each row
 --get different ranks for the row having similar values

```
SELECT *,
       ROW_NUMBER() OVER(ORDER BY Salary DESC) SalaryRank
FROM EmployeeSalary
```

| | EmployeeID | JobTitle | Salary | SalaryRank |
|----|------------|--------------------|--------|------------|
| 1 | 1006 | Regional Manager | 65000 | 1 |
| 2 | 1003 | Salesman | 63000 | 2 |
| 3 | 1005 | HR | 50000 | 3 |
| 4 | 1008 | Salesman | 48000 | 4 |
| 5 | 1004 | Accountant | 47000 | 5 |
| 6 | 1010 | NULL | 47000 | 6 |
| 7 | 1001 | Salesman | 45000 | 7 |
| 8 | NULL | Salesman | 43000 | 8 |
| 9 | 1009 | Accountant | 42000 | 9 |
| 10 | 1007 | Supplier Relations | 41000 | 10 |
| 11 | 1002 | Receptionist | 36000 | 11 |

2. RANK()

--specify rank for each row in the result set
 --use PARTITION BY to performs calculation on each group
 --each subset get rank as per Salary in descending order

USING PARTITION BY

```
SELECT *,
       RANK() OVER(PARTITION BY JobTitle ORDER BY Salary DESC)
SalaryRank
FROM EmployeeSalary
ORDER BY JobTitle, SalaryRank
```

| | EmployeeID | JobTitle | Salary | SalaryRank |
|----|------------|--------------------|--------|------------|
| 1 | 1010 | NULL | 47000 | 1 |
| 2 | 1004 | Accountant | 47000 | 1 |
| 3 | 1009 | Accountant | 42000 | 2 |
| 4 | 1005 | HR | 50000 | 1 |
| 5 | 1002 | Receptionist | 36000 | 1 |
| 6 | 1006 | Regional Manager | 65000 | 1 |
| 7 | 1003 | Salesman | 63000 | 1 |
| 8 | 1008 | Salesman | 48000 | 2 |
| 9 | 1001 | Salesman | 45000 | 3 |
| 10 | NULL | Salesman | 43000 | 4 |
| 11 | 1007 | Supplier Relations | 41000 | 1 |

NOT USING PARTITION BY

-- get SAME ranks for the row having similar values

```
SELECT *,
       RANK() OVER(ORDER BY Salary DESC) SalaryRank
FROM EmployeeSalary
ORDER BY SalaryRank
```

| | EmployeeID | JobTitle | Salary | SalaryRank |
|----|------------|--------------------|--------|------------|
| 1 | 1006 | Regional Manager | 65000 | 1 |
| 2 | 1003 | Salesman | 63000 | 2 |
| 3 | 1005 | HR | 50000 | 3 |
| 4 | 1008 | Salesman | 48000 | 4 |
| 5 | 1004 | Accountant | 47000 | 5 |
| 6 | 1010 | NULL | 47000 | 5 |
| 7 | 1001 | Salesman | 45000 | 7 |
| 8 | NULL | Salesman | 43000 | 8 |
| 9 | 1009 | Accountant | 42000 | 9 |
| 10 | 1007 | Supplier Relations | 41000 | 10 |
| 11 | 1002 | Receptionist | 36000 | 11 |



3. DENSE_RANK()

-- if have duplicate values, SQL assigns different ranks to those rows.
 -- will get the same rank for duplicate or similar values

```
SELECT *,
       DENSE_RANK() OVER(ORDER BY Salary DESC) SalaryRank
FROM EmployeeSalary
ORDER BY SalaryRank
```

| | EmployeeID | JobTitle | Salary | SalaryRank |
|----|------------|--------------------|--------|------------|
| 1 | 1006 | Regional Manager | 65000 | 1 |
| 2 | 1003 | Salesman | 63000 | 2 |
| 3 | 1005 | HR | 50000 | 3 |
| 4 | 1008 | Salesman | 48000 | 4 |
| 5 | 1004 | Accountant | 47000 | 5 |
| 6 | 1010 | NULL | 47000 | 5 |
| 7 | 1001 | Salesman | 45000 | 6 |
| 8 | NULL | Salesman | 43000 | 7 |
| 9 | 1009 | Accountant | 42000 | 8 |
| 10 | 1007 | Supplier Relations | 41000 | 9 |
| 11 | 1002 | Receptionist | 36000 | 10 |

RANK()

```
SELECT *,
       RANK() OVER(PARTITION BY JobTitle ORDER
BY Salary DESC) SalaryRank
FROM EmployeeSalary
ORDER BY JobTitle, SalaryRank
```

| | EmployeeID | JobTitle | Salary | SalaryRank |
|----|------------|--------------------|--------|------------|
| 1 | 1010 | NULL | 47000 | 1 |
| 2 | 1004 | Accountant | 47000 | 1 |
| 3 | 1009 | Accountant | 42000 | 2 |
| 4 | 1005 | HR | 50000 | 1 |
| 5 | 1002 | Receptionist | 36000 | 1 |
| 6 | 1006 | Regional Manager | 65000 | 1 |
| 7 | 1003 | Salesman | 63000 | 1 |
| 8 | 1001 | Salesman | 48000 | 2 |
| 9 | 1008 | Salesman | 48000 | 2 |
| 10 | NULL | Salesman | 43000 | 4 |
| 11 | 1007 | Supplier Relations | 41000 | 1 |

-- skip a rank if have similar values

DENSE_RANK()

```
SELECT *,
       DENSE_RANK() OVER(PARTITION BY JobTitle
ORDER BY Salary DESC) SalaryRank
FROM EmployeeSalary
ORDER BY JobTitle, SalaryRank
```

| | EmployeeID | JobTitle | Salary | SalaryRank |
|----|------------|--------------------|--------|------------|
| 1 | 1010 | NULL | 47000 | 1 |
| 2 | 1004 | Accountant | 47000 | 1 |
| 3 | 1009 | Accountant | 42000 | 2 |
| 4 | 1005 | HR | 50000 | 1 |
| 5 | 1002 | Receptionist | 36000 | 1 |
| 6 | 1006 | Regional Manager | 65000 | 1 |
| 7 | 1003 | Salesman | 63000 | 1 |
| 8 | 1001 | Salesman | 48000 | 2 |
| 9 | 1008 | Salesman | 48000 | 2 |
| 10 | NULL | Salesman | 43000 | 3 |
| 11 | 1007 | Supplier Relations | 41000 | 1 |

-- maintains the rank and does not give any gap
 for the values



4. NTILE()

-- can specify required how many group of result, and it will rank accordingly

```
SELECT *,
        NTILE(3) OVER(ORDER BY Salary DESC) SalaryRank
FROM EmployeeSalary
ORDER BY SalaryRank;
```

| | EmployeeID | JobTitle | Salary | SalaryRank | |
|----|------------|--------------------|--------|------------|-----------|
| 1 | 1006 | Regional Manager | 65000 | 1 | |
| 2 | 1003 | Salesman | 63000 | 1 | |
| 3 | 1005 | HR | 50000 | 1 | |
| 4 | 1001 | Salesman | 48000 | 1 | ← Group 1 |
| 5 | 1008 | Salesman | 48000 | 2 | |
| 6 | 1004 | Accountant | 47000 | 2 | ← Group 2 |
| 7 | 1010 | NULL | 47000 | 2 | |
| 8 | NULL | Salesman | 43000 | 2 | |
| 9 | 1009 | Accountant | 42000 | 3 | |
| 10 | 1007 | Supplier Relations | 41000 | 3 | ← Group 3 |
| 11 | 1002 | Receptionist | 36000 | 3 | |

USING PARTITION BY

```
SELECT *,
        NTILE(3) OVER(PARTITION BY JobTitle ORDER BY Salary DESC)
SalaryRank
FROM EmployeeSalary
ORDER BY JobTitle, SalaryRank;
```

| | EmployeeID | JobTitle | Salary | SalaryRank | |
|----|------------|--------------------|--------|------------|-----------|
| 1 | 1010 | NULL | 47000 | 1 | |
| 2 | 1004 | Accountant | 47000 | 1 | |
| 3 | 1009 | Accountant | 42000 | 2 | |
| 4 | 1005 | HR | 50000 | 1 | |
| 5 | 1002 | Receptionist | 36000 | 1 | |
| 6 | 1006 | Regional Manager | 65000 | 1 | |
| 7 | 1003 | Salesman | 63000 | 1 | ← Group 1 |
| 8 | 1001 | Salesman | 48000 | 1 | |
| 9 | 1008 | Salesman | 48000 | 2 | ← Group 2 |
| 10 | NULL | Salesman | 43000 | 3 | ← Group 3 |
| 11 | 1007 | Supplier Relations | 41000 | 1 | |



| <p>1. Write the query to show the invoice number, the customer number, the customer name, the invoice date, and the invoice amount for all customers with a customer balance of \$1,000 or more.</p> | <pre>select invoice_num,c.cust_num,c.cust_lname,c.cust_fname,inv_date,inv_amount from customer c, invoice where c.cust_num=invoice.cust_num and cust_balance>=1000</pre> <pre>select invoice_num,c.cust_num,cust_lname+' '+cust_fname as [Name],inv_date,inv_amount from customer c join invoice i on c.cust_num=i.cust_num where cust_balance>=1000</pre> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|-------------------|------------------|-----------------------------------|-----------------------------------|-----------------|-----------------------------------|-------------------|-----------------|------|-----------------------------------|---------------------------------|---------------------------------|---|-----------------------------------|-------------------|-----------------|-----------------------------------|-----------------------------------|-------------------|-----------------|------|-----------------------------------|------------------------------|------------------------------|---|------------------|------|------------------|-------------------------------|-------------------------------|---|-----------------|------|-----------------|----------------------------------|----------------------------------|---|------------------|------|------------------|----------------------------------|----------------------------------|---|-----------------|------|-----------------|-----------------------------------|-----------------------------------|
| <p>2. ISNULL(expression, value) --expression: to test whether is NULL, value: to return if expression is NULL</p> | <p>--ParcelID is same, but UniqueID is different; can assume that if the ParcelID is same, the Property Address will be same</p> <pre>Select a.ParcelID, a.PropertyAddress, b.ParcelID, b.PropertyAddress, ISNULL(a.PropertyAddress,b.PropertyAddress) From NashvilleHousing a JOIN NashvilleHousing b on a.ParcelID = b.ParcelID AND a.[UniqueID] <> b.[UniqueID] Where a.PropertyAddress is null</pre> <table><tr><th></th><th>ParcelID</th><th>PropertyAddress</th><th>ParcelID</th><th>PropertyAddress</th><th>(No column name)</th></tr><tr><td>1</td><td>025 07 0 031.00</td><td>NULL</td><td>025 07 0 031.00</td><td>410 ROSEHILL CT, GOODLETTSVILLE</td><td>410 ROSEHILL CT, GOODLETTSVILLE</td></tr><tr><td>2</td><td>026 01 0 069.00</td><td>NULL</td><td>026 01 0 069.00</td><td>141 TWO MILE PIKE, GOODLETTSVILLE</td><td>141 TWO MILE PIKE, GOODLETTSVILLE</td></tr><tr><td>3</td><td>026 05 0 017.00</td><td>NULL</td><td>026 05 0 017.00</td><td>208 EAST AVE, GOODLETTSVILLE</td><td>208 EAST AVE, GOODLETTSVILLE</td></tr><tr><td>4</td><td>026 06 0A 038.00</td><td>NULL</td><td>026 06 0A 038.00</td><td>109 CANTON CT, GOODLETTSVILLE</td><td>109 CANTON CT, GOODLETTSVILLE</td></tr><tr><td>5</td><td>033 06 0 041.00</td><td>NULL</td><td>033 06 0 041.00</td><td>1129 CAMPBELL RD, GOODLETTSVILLE</td><td>1129 CAMPBELL RD, GOODLETTSVILLE</td></tr><tr><td>6</td><td>033 06 0A 002.00</td><td>NULL</td><td>033 06 0A 002.00</td><td>1116 CAMPBELL RD, GOODLETTSVILLE</td><td>1116 CAMPBELL RD, GOODLETTSVILLE</td></tr><tr><td>7</td><td>033 15 0 123.00</td><td>NULL</td><td>033 15 0 123.00</td><td>438 W CAMPBELL RD, GOODLETTSVILLE</td><td>438 W CAMPBELL RD, GOODLETTSVILLE</td></tr></table> <p>-- Update record</p> <pre>Update a SET PropertyAddress = ISNULL(a.PropertyAddress,b.PropertyAddress) From NashvilleHousing a JOIN NashvilleHousing b on a.ParcelID = b.ParcelID AND a.[UniqueID] <> b.[UniqueID] Where a.PropertyAddress is null</pre> | | ParcelID | PropertyAddress | ParcelID | PropertyAddress | (No column name) | 1 | 025 07 0 031.00 | NULL | 025 07 0 031.00 | 410 ROSEHILL CT, GOODLETTSVILLE | 410 ROSEHILL CT, GOODLETTSVILLE | 2 | 026 01 0 069.00 | NULL | 026 01 0 069.00 | 141 TWO MILE PIKE, GOODLETTSVILLE | 141 TWO MILE PIKE, GOODLETTSVILLE | 3 | 026 05 0 017.00 | NULL | 026 05 0 017.00 | 208 EAST AVE, GOODLETTSVILLE | 208 EAST AVE, GOODLETTSVILLE | 4 | 026 06 0A 038.00 | NULL | 026 06 0A 038.00 | 109 CANTON CT, GOODLETTSVILLE | 109 CANTON CT, GOODLETTSVILLE | 5 | 033 06 0 041.00 | NULL | 033 06 0 041.00 | 1129 CAMPBELL RD, GOODLETTSVILLE | 1129 CAMPBELL RD, GOODLETTSVILLE | 6 | 033 06 0A 002.00 | NULL | 033 06 0A 002.00 | 1116 CAMPBELL RD, GOODLETTSVILLE | 1116 CAMPBELL RD, GOODLETTSVILLE | 7 | 033 15 0 123.00 | NULL | 033 15 0 123.00 | 438 W CAMPBELL RD, GOODLETTSVILLE | 438 W CAMPBELL RD, GOODLETTSVILLE |
| | ParcelID | PropertyAddress | ParcelID | PropertyAddress | (No column name) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 025 07 0 031.00 | NULL | 025 07 0 031.00 | 410 ROSEHILL CT, GOODLETTSVILLE | 410 ROSEHILL CT, GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 026 01 0 069.00 | NULL | 026 01 0 069.00 | 141 TWO MILE PIKE, GOODLETTSVILLE | 141 TWO MILE PIKE, GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 026 05 0 017.00 | NULL | 026 05 0 017.00 | 208 EAST AVE, GOODLETTSVILLE | 208 EAST AVE, GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 026 06 0A 038.00 | NULL | 026 06 0A 038.00 | 109 CANTON CT, GOODLETTSVILLE | 109 CANTON CT, GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 033 06 0 041.00 | NULL | 033 06 0 041.00 | 1129 CAMPBELL RD, GOODLETTSVILLE | 1129 CAMPBELL RD, GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 033 06 0A 002.00 | NULL | 033 06 0A 002.00 | 1116 CAMPBELL RD, GOODLETTSVILLE | 1116 CAMPBELL RD, GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 033 15 0 123.00 | NULL | 033 15 0 123.00 | 438 W CAMPBELL RD, GOODLETTSVILLE | 438 W CAMPBELL RD, GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>3. Split by delimiter</p> <ul style="list-style-type: none">❖ SUBSTRING(string, start, length)❖ CHARINDEX(substring, string, start)❖ LEN(string) | <pre>SELECT PropertyAddress, SUBSTRING(PropertyAddress, 1, CHARINDEX(',', PropertyAddress) -1) as Address , SUBSTRING(PropertyAddress, CHARINDEX(',', PropertyAddress) + 1 , LEN(PropertyAddress)) as City From NashvilleHousing</pre> <table><tr><th></th><th>PropertyAddress</th><th>Address</th><th>City</th></tr><tr><td>1</td><td>1808 FOX CHASE DR, GOODLETTSVILLE</td><td>1808 FOX CHASE DR</td><td>GOODLETTSVILLE</td></tr><tr><td>2</td><td>1832 FOX CHASE DR, GOODLETTSVILLE</td><td>1832 FOX CHASE DR</td><td>GOODLETTSVILLE</td></tr><tr><td>3</td><td>1864 FOX CHASE DR, GOODLETTSVILLE</td><td>1864 FOX CHASE DR</td><td>GOODLETTSVILLE</td></tr><tr><td>4</td><td>1853 FOX CHASE DR, GOODLETTSVILLE</td><td>1853 FOX CHASE DR</td><td>GOODLETTSVILLE</td></tr><tr><td>5</td><td>1829 FOX CHASE DR, GOODLETTSVILLE</td><td>1829 FOX CHASE DR</td><td>GOODLETTSVILLE</td></tr></table> <pre>ALTER TABLE NashvilleHousing Add PropertySplitAddress Nvarchar(255); ALTER TABLE NashvilleHousing Add PropertySplitCity Nvarchar(255);</pre> | | PropertyAddress | Address | City | 1 | 1808 FOX CHASE DR, GOODLETTSVILLE | 1808 FOX CHASE DR | GOODLETTSVILLE | 2 | 1832 FOX CHASE DR, GOODLETTSVILLE | 1832 FOX CHASE DR | GOODLETTSVILLE | 3 | 1864 FOX CHASE DR, GOODLETTSVILLE | 1864 FOX CHASE DR | GOODLETTSVILLE | 4 | 1853 FOX CHASE DR, GOODLETTSVILLE | 1853 FOX CHASE DR | GOODLETTSVILLE | 5 | 1829 FOX CHASE DR, GOODLETTSVILLE | 1829 FOX CHASE DR | GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | |
| | PropertyAddress | Address | City | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1808 FOX CHASE DR, GOODLETTSVILLE | 1808 FOX CHASE DR | GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 1832 FOX CHASE DR, GOODLETTSVILLE | 1832 FOX CHASE DR | GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 1864 FOX CHASE DR, GOODLETTSVILLE | 1864 FOX CHASE DR | GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 1853 FOX CHASE DR, GOODLETTSVILLE | 1853 FOX CHASE DR | GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 1829 FOX CHASE DR, GOODLETTSVILLE | 1829 FOX CHASE DR | GOODLETTSVILLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



❖ PARSENAME('object_name', object_piece)
--numbering works from right to left

❖ REPLACE(string, old_string, new_string)

```
Update NashvilleHousing
SET PropertySplitAddress = SUBSTRING(PropertyAddress, 1,
CHARINDEX(',', PropertyAddress) -1 )

Update NashvilleHousing
SET PropertySplitCity = SUBSTRING(PropertyAddress,
CHARINDEX(',', PropertyAddress) + 1 , LEN(PropertyAddress))
```

```
Select OwnerAddress,
PARSENAME(REPLACE(OwnerAddress, ',', '.'), 3)
, PARSENAME(REPLACE(OwnerAddress, ',', '.'), 2)
, PARSENAME(REPLACE(OwnerAddress, ',', '.'), 1)
From NashvilleHousing
```

| | OwnerAddress | (No column name) | (No column name) | (No column name) |
|---|---------------------------------------|-------------------|------------------|------------------|
| 1 | 1808 FOX CHASE DR, GOODLETTSVILLE, TN | 1808 FOX CHASE DR | GOODLETTSVILLE | TN |
| 2 | 1832 FOX CHASE DR, GOODLETTSVILLE, TN | 1832 FOX CHASE DR | GOODLETTSVILLE | TN |
| 3 | 1864 FOX CHASE DR, GOODLETTSVILLE, TN | 1864 FOX CHASE DR | GOODLETTSVILLE | TN |
| 4 | 1853 FOX CHASE DR, GOODLETTSVILLE, TN | 1853 FOX CHASE DR | GOODLETTSVILLE | TN |
| 5 | 1829 FOX CHASE DR, GOODLETTSVILLE, TN | 1829 FOX CHASE DR | GOODLETTSVILLE | TN |
| 6 | 1821 FOX CHASE DR, GOODLETTSVILLE, TN | 1821 FOX CHASE DR | GOODLETTSVILLE | TN |

```
ALTER TABLE NashvilleHousing
Add OwnerSplitAddress Nvarchar(255);
ALTER TABLE NashvilleHousing
Add OwnerSplitCity Nvarchar(255);
ALTER TABLE NashvilleHousing
Add OwnerSplitState Nvarchar(255);
```

```
Update NashvilleHousing
SET OwnerSplitAddress = PARSENAME(REPLACE(OwnerAddress,
',', '.'), 3)
```

```
Update NashvilleHousing
SET OwnerSplitCity = PARSENAME(REPLACE(OwnerAddress, ',',
'.'), 2)
```

```
Update NashvilleHousing
SET OwnerSplitState = PARSENAME(REPLACE(OwnerAddress, ',',
'.'), 1)
```

5. Remove duplicate records

```
WITH RowNumCTE AS(
Select *,
        ROW_NUMBER() OVER (
            PARTITION BY ParcelID,
                        PropertyAddress,
                        SalePrice,
                        SaleDate,
                        LegalReference
            ORDER BY UniqueID) as row_num
From NashvilleHousing
order by ParcelID
)
--DELETE
Select * From RowNumCTE
Where row_num > 1
Order by PropertyAddress
```