JOINS, UNIONS and Subqueries

.NET CORE

A JOIN is a means for combining columns from one or more tables by using values common to each.

HTTPS://EN.WIKIPEDIA.ORG/WIKI/JOIN_(SQL)

SQL JOIN Statements – Overview

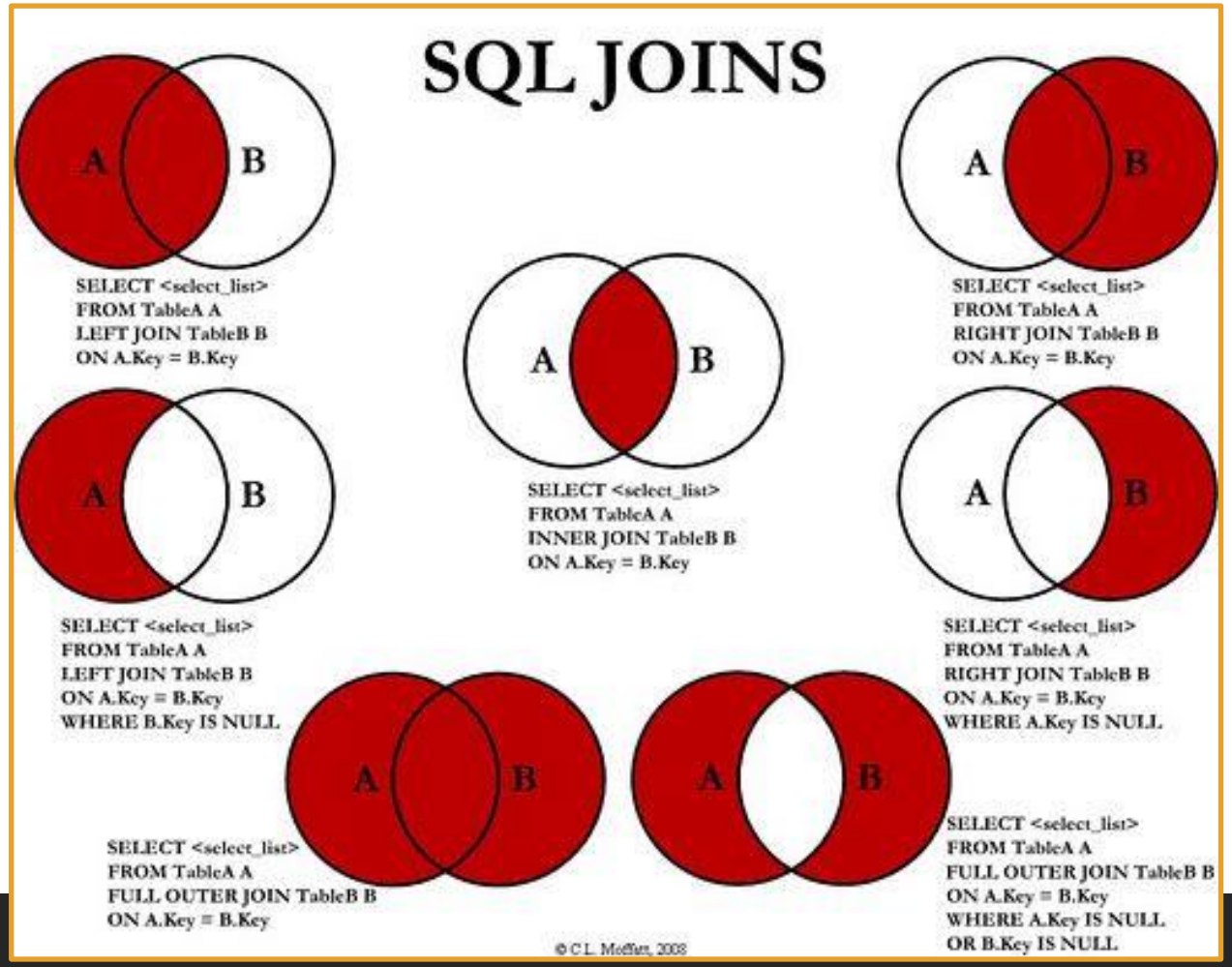
https://docs.microsoft.com/en-us/sql/relational-databases/performance/joins?view=sql-server-ver15#fundamentals

JOINs tell SQL how to use data from one table to select rows in a different table.

A JOIN statement defines the relationship between the tables by using keywords to:

- Specifying the column from each table to be compared for the JOIN.
- Specifying a logical operator (= or <>,) for comparing values from the indicated columns.

Typically, a JOIN condition uses a ***Foreign Key*** from one table and its associated ***Key*** in the other table.

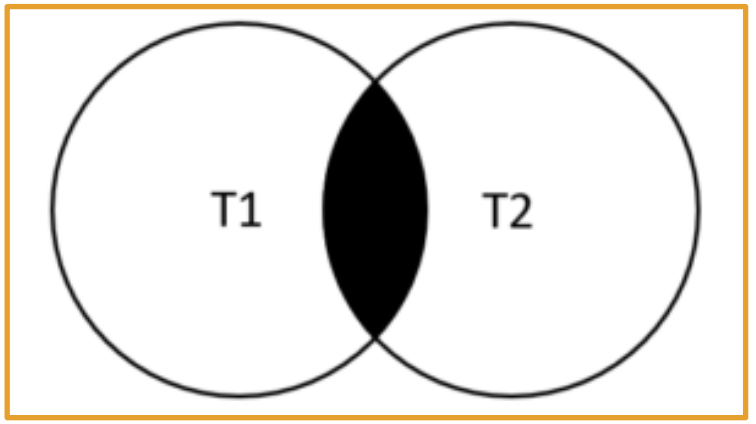


SQL JOIN Statement

https://docs.microsoft.com/en-us/sql/relational-databases/performance/joins?view=sql-server-ver15#fundamentals

The JOIN (aka INNER JOIN) Keyword combines with the WHERE and HAVING search conditions to control which rows are selected from the tables referenced in the FROM clause. Specifying the JOIN conditions in the FROM clause helps separate them from any other search conditions that may be specified in a WHERE clause. Below is the recommended clause to use for specifying JOINs.

INNER JOINS eliminate the rows that do not match with a row from the other table.



FROM [first_table] [join_type] [second_table] ON [join_condition]

This example:

- Specifies 3 unambiguous column names to return from the desired tables,
- Specifies the 2 tables to JOIN,
- Specifies the columns with shared data ON which to JOIN,
- Sets 2 constraints to filter on the results reported

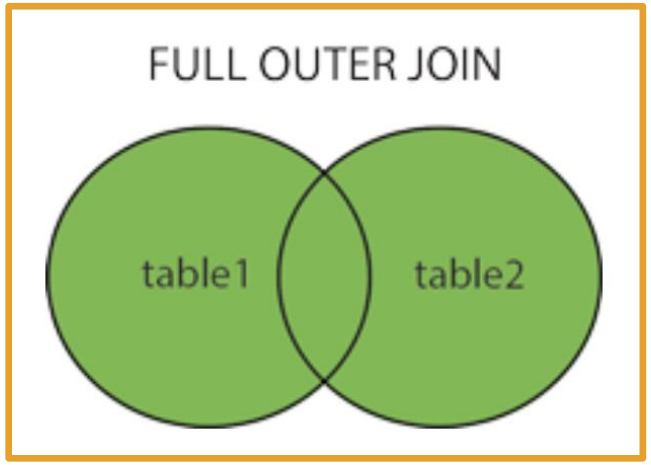
```
SELECT ProductID, Purchasing.Vendor.BusinessEntityID, Name
FROM Purchasing.ProductVendor JOIN Purchasing.Vendor
ON (Purchasing.ProductVendor.BusinessEntityID =
        Purchasing.Vendor.BusinessEntityID)
WHERE StandardPrice > $10 AND Name LIKE N'F%'
GO
```

SQL FULL JOIN Statement

https://docs.microsoft.com/en-us/sql/relational-databases/performance/joins?view=sql-server-ver15#fundamentals
https://www.w3schools.com/sql/sql_join_full.asp

FULL JOINs (aka OUTER JOIN) return all rows from at least one of the tables or views mentioned in the FROM clause, if those rows meet any WHERE or HAVING search conditions.

The order in which tables appear in an OUTER JOIN statement is significant. The first table mentioned is the "left" table and the second table is the "right" table. When you specify a left or right outer join, you are referring to the order in which the tables were added to the query and to the order in which they appear in the SQL statement in the SQL pane.



This example:

- Specifies 2 unambiguous column names to return from the desired tables,
- Specifies the 2 tables to FULL OUTER JOIN,
- Specifies the columns with shared data ON which to JOIN,
- Sets a constraint to order the result by CustomerName of the Customers table, Ascending (default).

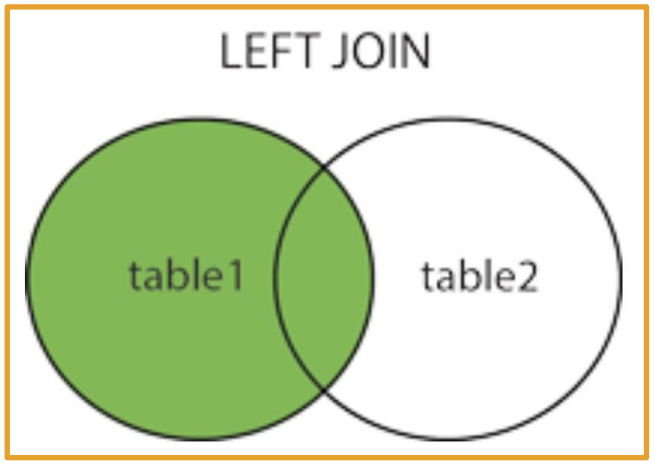
```
SELECT Customers.CustomerName, Orders.OrderID
FROM Customers FULL OUTER JOIN Orders
ON Customers.CustomerID=Orders.CustomerID
ORDER BY Customers.CustomerName;
```

SQL LEFT JOIN Statement

https://www.w3schools.com/sql/sql_join_left.asp

When you specify a LEFT or RIGHT OUTER JOIN, you are referring to the order in which the tables were written in the query. The first table mentioned in the query is the "left" table and the second table is the "right" table.

The LEFT JOIN keyword returns all records from the left table (table1), and the matched records from the right table (table2). The result is NULL from the right side, if there is no match.



This example:

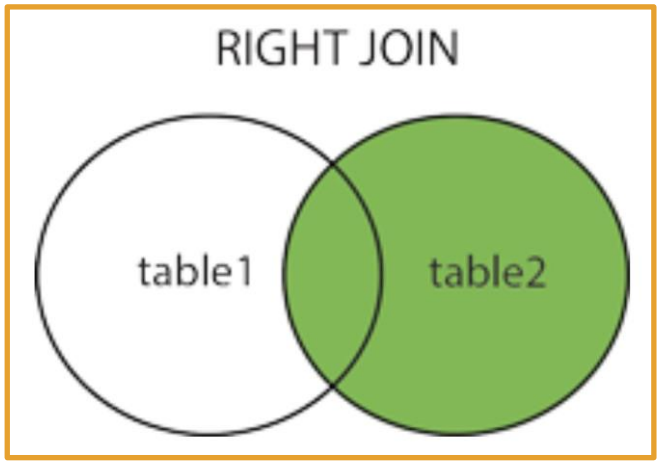
- Specifies 2 unambiguous column names to return from the desired tables,
- Specifies the 2 tables to LEFT JOIN,
- Specifies the columns with shared data ON which to LEFT JOIN,
- Sets a constraint to order the result by CustomerName of the Customers table, Ascending (default).

```
SELECT Customers.CustomerName, Orders.OrderID
FROM Customers LEFT JOIN Orders
ON Customers.CustomerID = Orders.CustomerID
ORDER BY Customers.CustomerName;
```

SQL RIGHT JOIN Statement

The first table mentioned in the query is the "left" table and the second table is the "right" table. When you specify a LEFT or RIGHT OUTER JOIN, you are referring to the order in which the tables were written in the query.

The RIGHT JOIN keyword returns all records from the right table (table2), and the matched records from the left table (table1). The result is NULL from the left side, if there is no match.



This example:

- Specifies 3 unambiguous column names to return from the desired tables,
- Specifies the 2 tables to RIGHT JOIN,
- Specifies the columns with shared data ON which to RIGHT JOIN,
- Sets a constraint to order the result by OrderID of the Orders table, Ascending (default).

```
SELECT Orders.OrderID, Employees.LastName,
Employees.FirstName

FROM Orders RIGHT JOIN Employees

ON Orders.EmployeeID = Employees.EmployeeID

ORDER BY Orders.OrderID;
```

SQL SELF JOIN

https://www.w3schools.com/sql/sql_join_self.asp

A SELF JOIN is exactly like a JOIN. The table is joined with a duplicate version of itself and the result generated.

This example:

- Specifies 3 unambiguous column names to return from the desired tables. The AS keyword allows you to designate a unique identifier.
- Specifies the 2 tables to SELF JOIN. No keywork is required, just a comma between the table names.
- Specifies the filter of CustomerID's that are not equal, but the city is the same.
- Sets a constraint to order the result by City name, Ascending (default).

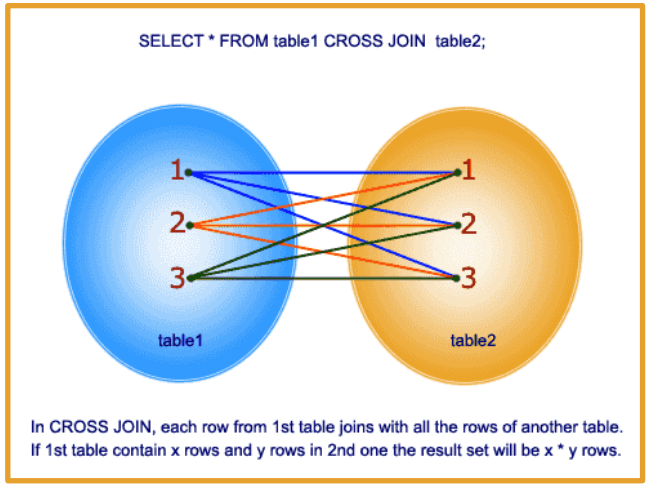
```
SELECT A.CustomerName AS
CustomerName1, B.CustomerName AS
CustomerName2, A.City

FROM Customers A, Customers B

WHERE A.CustomerID <> B.CustomerID
AND A.City = B.City

ORDER BY A.City;
```

SQL CROSS JOIN

https://www.w3resource.com/sql/joins/cross-join.php

CROSS JOIN produces a Cartesian Product. This is a result set which is the number of rows in the first table multiplied by the number of rows in the second table.

If the WHERE clause is used with CROSS JOIN, it functions like an INNER JOIN. You can also use comma-separated column names after SELECT and enter comma-separated table names after the FROM keyword.



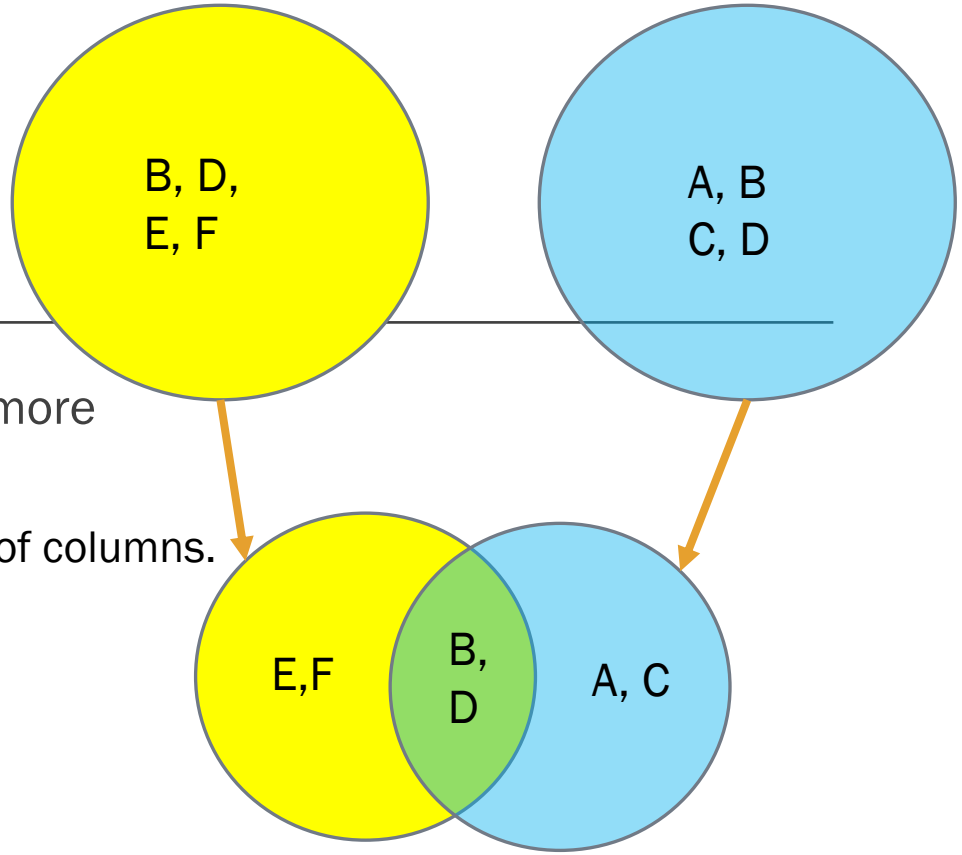
This example:

- Specifies 4 unambiguous column names from the desired tables.
- Specifies the 2 tables FROM which to CROSS JOIN. The first table to multiplied by all items in second table.

```
SELECT foods.item_name,foods.item_unit,
company.company_name,company.company_city
FROM foods CROSS JOIN company;
```

SQL UNION Operator

w3schools.com/sql/sql_union.asp



The UNION operator is used to combine the result-set of two or more SELECT statements.

- Each SELECT statement within UNION must have the same number of columns.
- The columns must also have similar data types.
- The columns in each SELECT statement must be in the same order.
- UNION selects only distinct values.

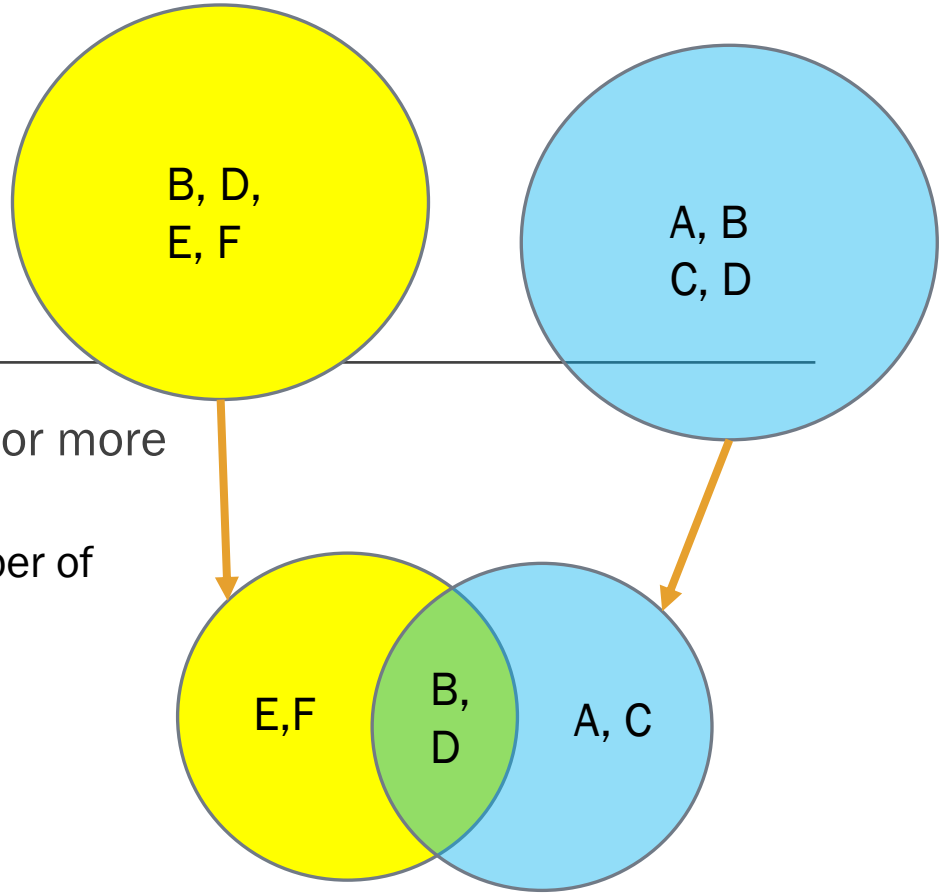
This example:

- Creates a complete SELECT statement
- Uses the UNION keyword
- Creates a separate SELECT statement identical to the first but querying a different table
- Sets a constraint to order the result by City name, Ascending (default).

```
SELECT City, Country FROM Customers
WHERE Country='Germany'
UNION
SELECT City, Country FROM Suppliers
WHERE Country='Germany'
ORDER BY City;
```

SQL UNION ALL Operator

w3schools.com/sql/sql_union.asp



The UNION ALL operator is used to combine the result-set of two or more SELECT statements.

- Each SELECT statement within UNION ALL must have the same number of columns.
- The columns must have similar data types.
- The columns in each SELECT statement must be in the same order.
- UNION ALL returns all values, even duplicates.

This example:

- Creates a complete SELECT statement
- Uses the UNION ALL keyword
- Creates a separate SELECT statement identical to the first but querying a different table
- Sets a constraint to order the result by City name, Ascending (default). This result includes duplicates.

```
SELECT City, Country FROM Customers
WHERE Country='Germany'
UNION ALL
SELECT City, Country FROM Suppliers
WHERE Country='Germany'
ORDER BY City;
```

SQL INTERSECT and EXCEPT Operators

https://docs.microsoft.com/en-us/sql/t-sql/language-elements/set-operators-except-and-intersect-transact-sql?view=sql-server-ver15

EXCEPT

- Returns any distinct values from the query left of the EXCEPT operator. Those values return as long the right query doesn't return those values as well.

INTERSECT

- Returns any distinct values that are returned by both the query on the left and right sides of the INTERSECT operator.

To combine the result sets of two queries that use EXCEPT or INTERSECT, the basic rules are:

- The number and the order of the columns must be the same in all queries.
- The data types must be compatible (implicitly convertible).
- EXCEPT and INTERSECT return the result set's column names that are the same as the column names that the query on the operator's left side returns.

SQL INTERSECT and EXCEPT Operators - Examples

https://docs.microsoft.com/en-us/sql/t-sql/language-elements/set-operators-except-and-intersect-transact-sql?view=sql-server-ver15

This INTERSECT example returns any distinct values that are returned by both the query on the left (above) and right (below) sides of the INTERSECT operator. This shows all products that have been ordered.

```
SELECT ProductID FROM Production.Product
INTERSECT
SELECT ProductID FROM Production.WorkOrder ;
```

This EXCEPT example returns any distinct values from the query left of the EXCEPT operator that are NOT also found on the right query. This shows all products that have NOT been ordered.

```
SELECT ProductID FROM Production.Product
EXCEPT
SELECT ProductID FROM Production.WorkOrder ;
```

SQL Subquery

https://docs.microsoft.com/en-us/sql/relational-databases/performance/subqueries?view=sql-server-ver15

A subquery is a query that is nested inside a SELECT, INSERT, UPDATE, or DELETE statement, or inside another subquery. A subquery can be used anywhere an expression is allowed. The subquery is evaluated then the outer query is evaluated against it.

Many SQL statements that include subqueries can be formulated as JOINS. There is usually no performance difference between a statement with a subquery and an equivalent JOIN. In some cases, where existence must be checked, a JOIN yields better performance. The nested query must be processed for each result of the outer query to ensure elimination of duplicates. In such cases, a JOIN approach would yield better results.

In this example, a subquery is used as a column expression named MaxUnitPrice in a SELECT statement. The subquery obtains the maximum price for each unit and them becomes a column in the outer query result.

```
SELECT Ord.SalesOrderID, Ord.OrderDate,
    (SELECT MAX(OrdDet.UnitPrice)
     FROM Sales.SalesOrderDetail AS OrdDet
     WHERE Ord.SalesOrderID = OrdDet.SalesOrderID) AS MaxUnitPrice
FROM Sales.SalesOrderHeader AS Ord;
```

Subquery

https://docs.microsoft.com/en-us/sql/relational-databases/performance/subqueries?view=sql-server-ver15

A subquery nested in an outer SELECT statement has the following components:

- A regular SELECT query including the regular select list components.
- A regular FROM clause including one or more table or view names.
- An optional WHERE clause.
- An optional GROUP BY clause.
- An optional HAVING clause.

This example shows two queries obtaining an identical result. One uses a subquery and the other uses a JOIN.

```
GO
SELECT Name
FROM Production.Product
WHERE ListPrice =
    (SELECT ListPrice
     FROM Production.Product
     WHERE Name = 'Chainring Bolts' );
GO

SELECT Prd1.Name
FROM Production.Product AS Prd1
     JOIN Production.Product AS Prd2
       ON (Prd1.ListPrice = Prd2.ListPrice)
WHERE Prd2.Name = 'Chainring Bolts';
GO
```

CTE (Common Table Expression)

https://docs.microsoft.com/en-us/sql/t-sql/queries/with-common-table-expression-transact-sql?view=sql-server-ver15

A ***Common Table Expression*** is an expression that creates a temporary table, first, that is then queried by the following query. A ***Recursive Common Table Expression*** is a CTE which references itself.

1. Define the CTE expression name and column list.
    1. Use the WITH keyword followed by the CTE name and a list of comma-separated columns.
2. Define the CTE query.
    1. Use the AS keyword and write a query (in parenthesis) to query an existing table.
3. Define the outer query referencing the CTE name.
    1. Create a regular query with one exception.
    2. After SELECT and the column list,
    3. use the FROM keyword and state the name of the desired CTE
    4. Complete the query as normal
4. Now your outer query will use the CTE as its source.

```
WITH Sales_CTE (SalesPersonID, SalesOrderID, SalesYear)
AS
(
    SELECT SalesPersonID, SalesOrderID, YEAR(OrderDate)
                AS SalesYear
    FROM Sales.SalesOrderHeader
    WHERE SalesPersonID IS NOT NULL
)
SELECT SalesPersonID,
                COUNT(SalesOrderID) AS TotalSales,
                SalesYear
FROM Sales_CTE
GROUP BY SalesYear, SalesPersonID
ORDER BY SalesPersonID, SalesYear;
```