

# Introduction to T-SQL Queries




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# Agenda

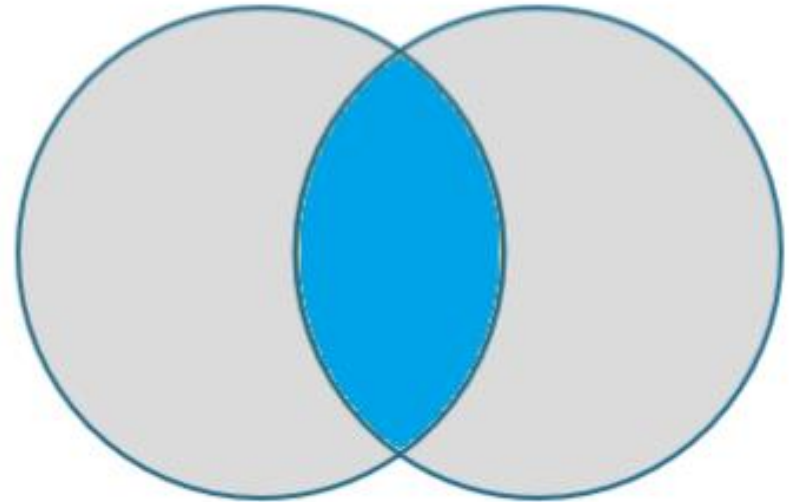
- Class 1
  - Module 1: Introduction
  - Module 2: Simple select statements
  - Module 3: Filtering
- Class 2
  - Module 4: Expressions
  - Module 5: Joining
- Class 3
  - Module 5: Joining (Continued)
  - Module 6: Grouping
- Class 4
  - Module 7: Subqueries
  - Module 8: UNION

# Module 5: Joining Tables

# INNER JOIN

- The columns from two tables where there is a match on a key
- Syntax

```
SELECT <table1>.<col1>,<table2>.<col2>  
FROM <table1> [INNER] JOIN <table2>  
ON <table1>.<col1> = <table2>.<col1>
```



# Old join syntax: Comma join (Don't use!)

```
SELECT Col1, Col1  
FROM table1, table2  
Where table1.col1 = table2.col1
```

- Used more often by Oracle developers than SQL Server devs

# INNER JOIN

Customer	
CustomerID (Primary Key)	Name
1	John
2	Sharon
3	Dana
4	Fox

Sale		
SaleID (Primary Key)	CustomerID (Foreign Key)	Amt
1	3	100
2	1	200
3	3	75
4	3	90
5	1	100

Query results			
SaleID	CustomerID	Name	Amt
1	3	Dana	100
2	1	John	200
3	3	Dana	75
4	3	Dana	90
5	1	John	100

Demo: INNER JOIN



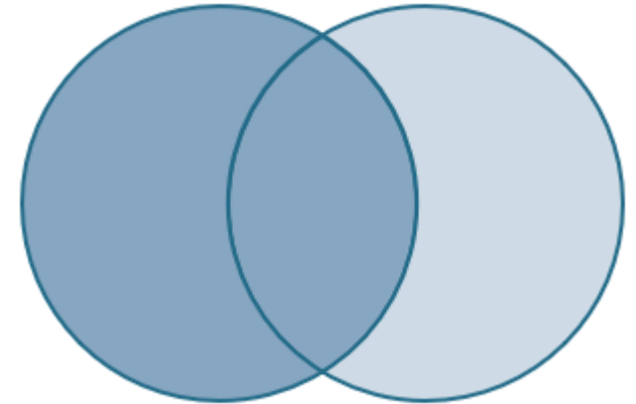
# Lab

- Complete Module 5 Lab 1

# LEFT OUTER JOIN

- All the rows from first table even if they don't match
- Once you start down the left path, continue left
- Syntax

```
SELECT <table1>.<col1>, <table2><col2>  
FROM <table1>  
LEFT [OUTER] JOIN <table2>  
ON <table1>.<col1> = <table2>.<col2>
```



# LEFT OUTER JOIN

Customer	
CustomerID	Name
1	John
2	Sharon
3	Dana
4	Fox

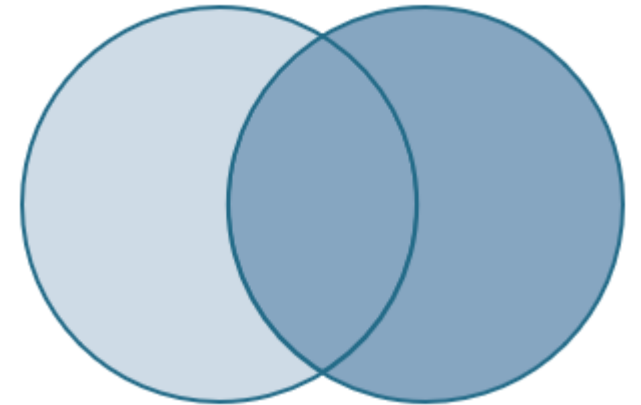
Sale		
SaleID	CustomerID	Amt
1	3	100
2	1	200
3	3	75
4	3	90
5	1	100

Query results			
SaleID	CustomerID	Name	Amt
1	3	Dana	100
2	1	John	200
3	3	Dana	75
4	3	Dana	90
5	1	John	100
NULL	2	Sharon	NULL
NULL	4	Fox	NULL

# RIGHT OUTER JOIN

- All the rows from second table even if they don't match
- Not used as much
- Syntax

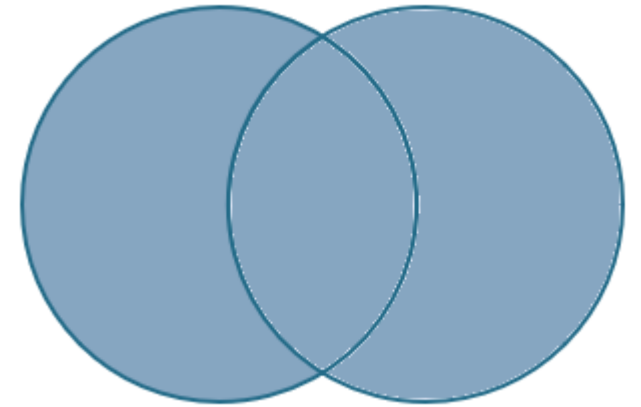
```
SELECT <table1>.<col1>, <table2><col2>  
FROM <table1>  
RIGHT [OUTER] JOIN <table2>  
ON <table1>.<col1> = <table2>.<col2>
```



# FULL OUTER JOIN

- All the rows from both tables even if they don't match
- Rarely used
- Syntax

```
SELECT <table1>.<col1>, <table2>.<col2>  
FROM <table1>  
FULL [OUTER] JOIN <table2>  
ON <table1>.<col1> = <table2>.<col2>
```



Demo: OUTER JOIN

# Lab

- Complete Module 5 Lab 2

# LEFT OUTER JOIN with NULL RIGHT Filter

- Use to find rows that don't match
- Filter on a key from the table on the right
- Syntax

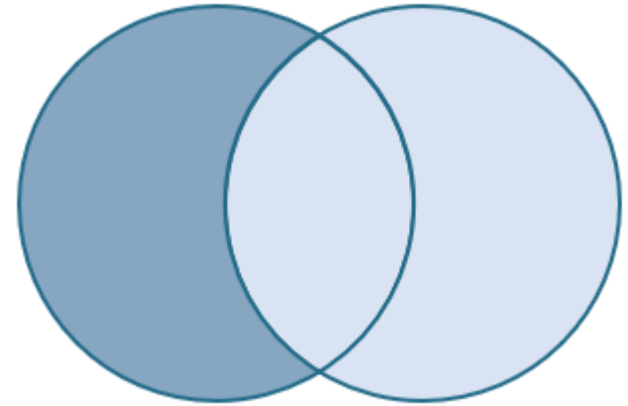
```
SELECT <table1>.<col1>,<table2>.<col2>
```

```
FROM <table1>
```

```
LEFT [OUTER] JOIN <table2>
```

```
ON <table1>.<col1 > = <table2>.<col1>
```

```
WHERE <table2>.<col1> IS NULL
```





# LEFT OUTER JOIN with NULL right table filter

Customer	
CustomerID	Name
1	John
2	Sharon
3	Dana
4	Fox

Sale		
SaleID	CustomerID	Amt
1	3	100
2	1	200
3	3	75
4	3	90
5	1	100

Query results			
SaleID	CustomerID	Name	Amt
NULL	2	Sharon	NULL
NULL	4	Fox	NULL

Demo: OUTER JOIN with FILTER

# Lab

- Complete Module 5 Lab 3

# Module 6: Grouping

# Grouping

- Summarize the data
- Special functions called aggregate
  - COUNT
  - SUM
  - AVG
  - MIN
  - MAX
- Return one row per group

# Summary (aggregate) query

CustID	OrderID	Amt
1	101	5
2	102	10
3	103	7

```
SELECT
    COUNT(CustID) AS OrderCount,
    MIN(OrderID) AS FirstOrderID,
    SUM(Amt) SumOfOrders,
    AVG(Amt) AvgAmt
FROM Orders;
```

OrderCount	FirstOrderID	SumOfOrders	AvgAmt
3	101	22	7.33

# GROUP BY clause

- Columns in the SELECT list or ORDER BY must be in an aggregate function or in the GROUP BY
- Syntax

```
SELECT <col1>, <ag function>(<col2>)  
FROM <table1>  
GROUP BY <col1>
```

# Aggregate Queries

CustID	OrderID	TotalDue
1	1	50
2	2	76
1	3	150
1	4	25
3	5	100
3	6	30
2	7	60
1	8	90



## Group by CustID

CustID	OrderID	TotalDue
1	1	50
2	2	76
1	3	150
1	4	25
3	5	100
3	6	30
2	7	60
1	8	90



CustID	OrderID	TotalDue
1	1	50
1	3	150
1	4	25
1	8	90



CustID	OrderID	TotalDue
2	2	76
2	7	60



CustID	OrderID	TotalDue
3	5	100
3	6	30

## Apply any aggregate functions: SUM, AVG, COUNT...

CustID	OrderID	TotalDue
1	1	50
2	2	76
1	3	150
1	4	25
3	5	100
3	6	30
2	7	60
1	8	90



CustID	OrderID	TotalDue
1	1	50
1	3	150
1	4	25
1	8	90

COUNT(OrderID) = 4  
SUM(TotalDue) = 315  
MAX(OrderID) = 8



CustID	OrderID	TotalDue
2	2	76
2	7	60

COUNT(OrderID) = 2  
SUM(TotalDue) = 136  
MAX(OrderID) = 7



CustID	OrderID	TotalDue
3	5	100
3	6	30

COUNT(OrderID) = 2  
SUM(TotalDue) = 130  
MAX(OrderID) = 6

Return 1 row per group

CustID	OrderID	TotalDue
1	1	50
2	2	76
1	3	150
1	4	25
3	5	100
3	6	30
2	7	60
1	8	90

CustID	OrderID	TotalDue
1	1	50
1	3	150
1	4	25
1	8	90

CustID	OrderID	TotalDue
2	2	76
2	7	60

CustID	OrderID	TotalDue
3	5	100
3	6	30

CustID	Order Count	Last Order	Total
1	4	8	315
2	2	7	136
3	2	6	130

```
SELECT CustID, COUNT(*) AS [Order Count], MAX(OrderID) AS [Last Order], SUM(TotalDue) AS Total
FROM Sales
GROUP BY CustID
```

DEMO: GROUP BY

# Lab

- Complete Module 6 Lab 1

# HAVING

- Use to filter the groups using an aggregate function
- Use WHERE to filter rows
- Use HAVING to filter groups

Return 1 row per group

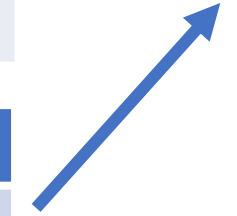
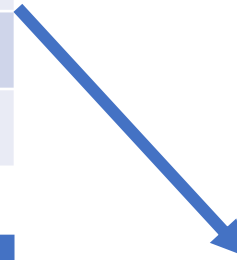
CustID	OrderID	TotalDue
1	1	50
2	2	76
1	3	150
1	4	25
3	5	100
3	6	30
2	7	60
1	8	90



CustID	OrderID	TotalDue
1	1	50
1	3	150
1	4	25
1	8	90

CustID	OrderID	TotalDue
2	2	76
2	7	60

CustID	OrderID	TotalDue
3	5	100
3	6	30



CustID	Order Count	Last Order	Total
1	4	8	315
2	2	7	136
3	2	6	130

HAVING COUNT(OrderID) > 2

CustID	OrderID	TotalDue
1	1	50
2	2	76
1	3	150
1	4	25
3	5	100
3	6	30
2	7	60
1	8	90

CustID	OrderID	TotalDue
1	1	50
1	3	150
1	4	25
1	8	90

CustID	OrderID	TotalDue
2	2	76
2	7	60

CustID	OrderID	TotalDue
3	5	100
3	6	30

CustID	Order Count	Last Order	Total
1	4	8	315
2	2	7	136
3	2	6	130

CustID	Order Count	Last Order	Total
1	4	8	315



DEMO: HAVING

# Lab

- Complete Module 6 Lab 2

# Module 7:

## Subqueries and Common Table Expressions

# IN Subquery

- Use a query to generate a list for the WHERE clause

```
SELECT <column list>  
FROM <schema>.<table1>  
WHERE <col> IN (SELECT <col> FROM <schema>.<table2>)
```

```
SELECT <column list>  
FROM <schema>.<table1>  
WHERE <col> NOT IN (SELECT <col> FROM <schema>.<table2>)
```

DEMO: IN Subquery

# Lab

- Complete Module 7 Lab 1

# Correlated subquery

- Typically in the SELECT list
- Pull a scalar or single value into a query
- Inner query can see outer query
- Only one column allowed in the subquery
- Often used to separate logic from outer query

# Correlated subquery

CustID	OrderID	Amt
1	101	5
2	102	10
1	103	70
3	104	30
2	105	90
1	106	15

```
SELECT
    CustID, OrderID, Amt
FROM Orders AS Ord;
```

CustID	OrderID	Amt	AvgAmt
1	101	5	30
2	102	10	50
1	103	70	30
3	104	30	30
2	105	90	50
1	106	15	30

```
SELECT
    CustID, OrderID, Amt,
    (SELECT AVG(AMT)
     FROM Orders
     WHERE CustID = Ord.CustID ) AS AvgAmt
FROM Orders AS Ord;
```



# DEMO: Correlated Subquery

# Lab

- Complete Module 7 Lab 2

# Derived table

- Subquery in the FROM clause
- Also used to separate the logic
- Join to the subquery
- Outer query can see the columns in the SELECT list
- Often nested

# Common table expression (CTE)

- Similar to derived table
- Defined up front
- No nesting, but one CTE can use other CTEs
- Also used to separate logic
- Previous statement MUST end with ;

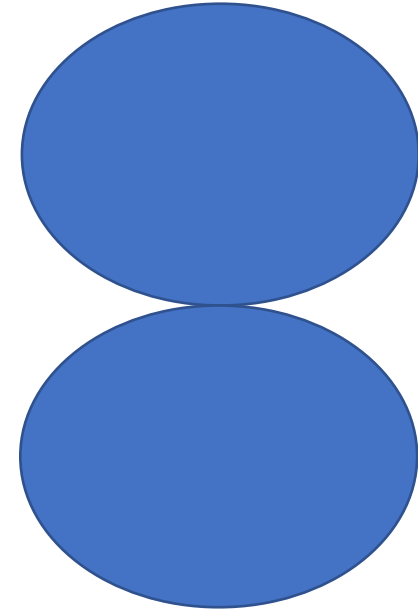
# DEMO: Derived tables and CTEs

# Lab

- Complete Module 7 Lab 3

# UNION

- Combine the results of two queries
- Rules
  - Same number of columns
  - Compatible data types
  - Names from first query
  - ORDER BY at end
- Also UNION ALL, EXCEPT, and INTERCEPT



# UNION – Eliminates Duplicates

Names

ID	Name
1	Kevin
2	Sam
3	Jane
4	Kathi

Customers

CustID	FirstName
100	Bill
120	Denise
130	Anna
4	Kathi

ID	Name
1	Kevin
2	Sam
3	Jane
4	Kathi
100	Bill
120	Denise
130	Anna

```
SELECT ID, NAME  
FROM Names  
UNION  
SELECT CustID, FirstName  
FROM Customers;
```



# UNION ALL – Retains duplicates

Names

ID	Name
1	Kevin
2	Sam
3	Jane
4	Kathi

Customers

CustID	FName
100	Bill
120	Denise
130	Anna
4	Kathi

ID	Name
1	Kevin
2	Sam
3	Jane
4	Kathi
100	Bill
120	Denise
130	Anna
4	Kathi

```
SELECT ID, NAME
FROM Names
UNION ALL
SELECT CustID, FirstName
FROM Customers;
```

# Except – Find items that don't match

Names

ID	Name
1	Kevin
2	Sam
3	Jane
4	Kathi

Customers

CustID	FName
100	Bill
120	Denise
130	Anna
4	Kathi

ID	Name
1	Kevin
2	Sam
3	Jane

```
SELECT ID, NAME  
FROM Names  
EXCEPT  
SELECT CustID, FirstName  
FROM Customers;
```

# INTERSECT – Find rows that match

Names

ID	Name
1	Kevin
2	Sam
3	Jane
4	Kathi

Customers

CustID	FName
100	Bill
120	Denise
130	Anna
4	Kathi

ID	Name
4	Kathi

```
SELECT ID, NAME  
FROM Names  
INTERSECT  
SELECT CustID, FirstName  
FROM Customers;
```

Demo: UNION

# Lab

- Complete Module 8 Lab 1