







## CROSS JOINS



```
1 USE Northwinds2022TSQLV7
2
3 SELECT C.CustomerId, E.EmployeeId
4 FROM Sales.Customer AS C
5      CROSS JOIN HumanResources.Employee AS E;
```

(819 rows affected)

Total execution time: 00:00:00.012



	CustomerId	EmployeeId
81	81	1
82	82	1
83	83	1
84	84	1
85	85	1
86	86	1
87	87	1
88	88	1
89	89	1
90	90	1
91	91	1
92	1	2
93	2	2
94	3	2
95	4	2
96	5	2
97	6	2

## SELF CROSS JOINS



```
1 USE Northwinds2022TSQV7
2 SELECT E1.EmployeeId, E2.EmployeeId
3 FROM HumanResources.Employee AS E1
4 CROSS JOIN HumanResources.Employee AS E2;
```

(81 rows affected)

Total execution time: 00:00:00.011



	EmployeeId ▾	EmployeeId ▾
1	1	1
2	2	1
3	3	1
4	4	1
5	5	1
6	6	1
7	7	1
8	8	1
9	9	1
10	1	2
11	2	2
12	3	2
13	4	2
14	5	2
15	6	2
16	7	2

Producing Tables of Numbers (Application of self cross join)

```

[7] 1  USE Northwinds2022TSQV7
2  DROP TABLE IF EXISTS dbo.Digit;
3  CREATE TABLE dbo.Digit (digit INT NOT NULL PRIMARY KEY);
4  INSERT INTO dbo.Digit (digit)
5    VALUES (0), (1), (2), (3), (4), (5), (6), (7), (8), (9);
6
7  SELECT digit FROM dbo.Digit;
8
9  SELECT D3.digit * 100 + D2.digit * 10 + D1.digit + 1 AS n -- multiply by power of 10. 100, 10, digit table itself (ones). +1 is to discard 0.
10 FROM dbo.Digit AS D1
11     CROSS JOIN dbo.Digit AS D2
12     CROSS JOIN dbo.Digit AS D3
13 ORDER BY n;
14

```

(10 rows affected)

(10 rows affected)

(1000 rows affected)

Total execution time: 00:00:00.041



	digit
1	0
2	1
3	2
4	3
5	4
6	5
7	6
8	7

982	982
983	983
984	984
985	985
986	986
987	987
988	988
989	989
990	990
991	991
992	992
993	993
994	994
995	995
996	996
997	997
998	998
999	999
1000	1000

INNER JOINS OR JOINS

```

1  USE Northwinds2022TSQLV7
2  SELECT E.EmployeeId, E.EmployeeFirstName, E.EmployeeLastName, O.OrderId
3  FROM HumanResources.Employee AS E
4       INNER JOIN SALES.[Order] AS O
5       ON E.EmployeeId = O.EmployeeId

```

(830 rows affected)

Total execution time: 00:00:00.018

	EmployeeId	EmployeeFirstName	EmployeeLastName	OrderId
1	5	Sven	Mortensen	10248
2	6	Paul	Suurs	10249
3	4	Yael	Peled	10250
4	3	Judy	Lew	10251
5	4	Yael	Peled	10252
6	3	Judy	Lew	10253
7	5	Sven	Mortensen	10254
8	9	Patricia	Devle	10255

## COMPOSITE JOINS

```

7
8  --In the following table creation, there are two columns in Sales.OrderDetailsAudit that are also present in Sales.OrderDetail: orderid
9  USE Northwinds2022TSQLV7
10 DROP TABLE IF EXISTS Sales.OrderDetailsAudit;
11
12 CREATE TABLE Sales.OrderDetailsAudit(
13     lsn INT NOT NULL IDENTITY,
14     orderid INT NOT NULL,
15     productid INT NOT NULL,
16     dt DATETIME NOT NULL,
17     loginname sysname NOT NULL,
18     columnname sysname NOT NULL,
19     oldval SQL_VARIANT,
20     newval SQL_VARIANT,
21     CONSTRAINT PK_OrderDetailsAudit PRIMARY KEY (lsn),
22     CONSTRAINT FK_OrderDetailsAudit_OrderDetails
23         FOREIGN KEY(orderid, productid)
24         REFERENCES Sales.OrderDetail (OrderId, ProductId)
25 );
26
27 SELECT OD.OrderId, OD.ProductId, OD.Quantity,
28        ODA.dt, ODA.loginname, ODA.oldval, ODA.newval
29 FROM Sales.OrderDetail AS OD
30     INNER JOIN Sales.OrderDetailsAudit AS ODA
31     ON OD.orderid = ODA.orderid
32     AND OD.productid = ODA.productid
33 WHERE ODA.columnname = N'qty';

```

(0 rows affected)

Total execution time: 00:00:00.029

OrderId	ProductId	Quantity	dt	loginname	oldval	newval
---------	-----------	----------	----	-----------	--------	--------

## NON-EQUI JOINS

1	USE Northwinds2022TSQV7
2	SELECT
3	E1.EmployeeId, E1.EmployeeFirstName, E1.EmployeeLastName,
4	E2.EmployeeId, E2.EmployeeFirstName, E2.EmployeeLastname
5	FROM HumanResources.Employee AS E1
6	INNER JOIN HumanResources.Employee AS E2
7	ON E1.EmployeeId < E2.EmployeeId
8	ORDER BY E1.EmployeeId;

(36 rows affected)

Total execution time: 00:00:00.007

	EmployeeId	EmployeeFirstName	EmployeeLastName	EmployeeId	EmployeeFirstName	EmployeeLastname
1	1	Sara	Davis	2	Don	Funk
2	1	Sara	Davis	3	Judy	Lew
3	1	Sara	Davis	4	Yael	Peled
4	1	Sara	Davis	5	Sven	Mortensen
5	1	Sara	Davis	6	Paul	Suurs
6	1	Sara	Davis	7	Russell	King
7	1	Sara	Davis	8	Maria	Cameron
8	1	Sara	Davis	9	Patricia	Doyle
9	2	Don	Funk	3	Judy	Lew
10	2	Don	Funk	4	Yael	Peled
11	2	Don	Funk	5	Sven	Mortensen
12	2	Don	Funk	6	Paul	Suurs
13	2	Don	Funk	7	Russell	King
14	2	Don	Funk	8	Maria	Cameron

## MULTI- JOIN QUERIES

```

1  USE Northwinds2022TSQLV7
2  SELECT
3      C.CustomerId, C.CustomerCompanyName,
4      O.OrderId,
5      OD.ProductId, OD.Quantity
6  FROM Sales.Customer AS C
7      INNER JOIN Sales.[Order] AS O
8          ON C.CustomerId = O.CustomerId
9      INNER JOIN Sales.OrderDetail AS OD
10         ON O.OrderId = OD.OrderId;

```

(2155 rows affected)

Total execution time: 00:00:00.027

	CustomerId	CustomerCompanyName	OrderId	ProductId	Quantity
16	34	Customer IBVRG	10253	39	42
17	34	Customer IBVRG	10253	49	40
18	14	Customer WNMAF	10254	24	15
19	14	Customer WNMAF	10254	55	21
20	14	Customer WNMAF	10254	74	21
21	68	Customer CCKOT	10255	2	20

## OUTER JOIN

```

1  USE Northwinds2022TSQLV7
2  SELECT C.CustomerId,C.CustomerCompanyName,
3      O.orderid
4  FROM Sales.Customer AS C
5      LEFT OUTER JOIN Sales.[Order] as O
6          ON C.CustomerId = O.CustomerId
7  ORDER BY C.CustomerID;
8
9  --Notice that the output includes NULL under OrderId.
10
11  --The following only identifies the customers with no orders:
12  SELECT C.CustomerId,C.CustomerCompanyName,
13      O.orderid
14  FROM Sales.Customer AS C
15      LEFT OUTER JOIN Sales.[Order] as O
16          ON C.CustomerId = O.CustomerId
17  WHERE O.OrderId IS NULL;
18

```

(832 rows affected)

(2 rows affected)

Total execution time: 00:00:00.041



	CustomerId	CustomerCompanyName	orderid
185	21	Customer KIDPX	10512
186	21	Customer KIDPX	10650
187	21	Customer KIDPX	10581
188	21	Customer KIDPX	10725
189	22	Customer DTDMM	NULL
190	23	Customer WVFAF	10763
191	23	Customer WVFAF	10789
192	23	Customer WVFAF	10634
193	23	Customer WVFAF	10480
194	23	Customer WVFAF	10408
195	24	Customer CYZTN	10434
196	24	Customer CYZTN	10460
197	24	Customer CYZTN	10533
198	24	Customer CYZTN	10378
199	24	Customer CYZTN	10327



	CustomerId	CustomerCompanyName	orderid
1	22	Customer DTDMM	NULL
2	57	Customer WVAXS	NULL

Using outer joins to identify and include the missing values



```

16 --then outer join between the dates and the orders.
17
18 SELECT DATEADD (day, Nums.n-1, CAST('20140701' AS DATE)) AS DerivedOrderDate, O.OrderDate,
19         O.orderId, O.CustomerId, O.EmployeeId
20 FROM dbo.Nums
21     LEFT OUTER JOIN Sales.[Order] AS O
22         ON DATEADD (day, Nums.n-1, CAST('20140701' AS DATE)) = O.orderdate
23 WHERE Nums.n <= datediff (day, '20140701', '20161231')
24        --AND o.OrderDate is NULL
25 ORDER BY DerivedOrderDate;

```

3	2014-07-03	NULL	NULL	NULL	NULL
4	2014-07-04	2014-07-04	10248	85	5
5	2014-07-05	2014-07-05	10249	79	6
6	2014-07-06	NULL	NULL	NULL	NULL
7	2014-07-07	NULL	NULL	NULL	NULL
8	2014-07-08	2014-07-08	10250	34	4
9	2014-07-08	2014-07-08	10251	84	3
10	2014-07-09	2014-07-09	10252	76	4
11	2014-07-10	2014-07-10	10253	34	3
12	2014-07-11	2014-07-11	10254	14	5
13	2014-07-12	2014-07-12	10255	68	9
14	2014-07-13	NULL	NULL	NULL	NULL
15	2014-07-14	NULL	NULL	NULL	NULL
16	2014-07-15	2014-07-15	10256	88	3
17	2014-07-16	2014-07-16	10257	35	4
18	2014-07-17	2014-07-17	10258	20	1
19	2014-07-18	2014-07-18	10259	13	4
20	2014-07-19	2014-07-19	10260	56	4

OUTER JOINS: MISTAKE TO AVOID

```

1  USE Northwinds2022TSQLV7
2  SELECT C.CustomerId, C.CustomerCompanyName, O.OrderId, O.OrderDate
3  FROM Sales.Customer AS C
4       LEFT Outer JOIN Sales.[Order] AS O
5           ON C.CustomerId = O.CustomerId
6  WHERE O.OrderDate >= '20160101';

```



	CustomerId	CustomerCompanyName	OrderId	OrderDate
58	20	Customer THHDP	10979	2016-03-26
59	20	Customer THHDP	10968	2016-03-23
60	20	Customer THHDP	11072	2016-05-05
61	20	Customer THHDP	10895	2016-02-18
62	20	Customer THHDP	10836	2016-01-16
63	20	Customer THHDP	10854	2016-01-27
64	24	Customer CYZTN	10880	2016-02-10
65	24	Customer CYZTN	10824	2016-01-09
66	24	Customer CYZTN	10902	2016-02-23
67	24	Customer CYZTN	11050	2016-04-27
68	24	Customer CYZTN	10955	2016-03-17
69	24	Customer CYZTN	10980	2016-03-27
70	24	Customer CYZTN	10977	2016-03-26
71	24	Customer CYZTN	10993	2016-04-01
72	24	Customer CYZTN	11001	2016-04-06
73	25	Customer AZJED	11012	2016-04-09
74	25	Customer AZJED	10929	2016-03-05
75	25	Customer AZJED	10859	2016-01-29
76	26	Customer USDBG	10860	2016-01-29

USING OUTER JOINS IN A MULTI-JOIN QUERY

```

1  --The following query is bad becaues of the reason above.
2  USE Northwinds2022TSQLV7
3  SELECT C.CustomerId, O.OrderId, OD.ProductId, OD.Quantity
4  FROM Sales.Customer AS C
5       LEFT OUTER JOIN Sales.[Order] AS O
6           ON C.CustomerId = O.CustomerId
7       INNER JOIN Sales.OrderDetail AS OD
8           ON O.OrderId = Od.OrderId;
9

```

478	21	10386	24	15
479	21	10386	34	10
480	21	10414	19	18
481	21	10414	33	50
482	23	10408	37	10
483	23	10408	54	6
484	23	10408	62	35
485	23	10480	47	30

--Work- around 1 (both left outer joins): This might not be good. What if th  
SELECT C.CustomerId, O.OrderId, OD.ProductId, OD.Quantity  
FROM Sales.Customer AS C

LEFT OUTER JOIN Sales.[Order] AS O  
ON C.CustomerId = O.CustomerId  
LEFT OUTER JOIN Sales.OrderDetail AS OD  
ON O.OrderId = Od.OrderId;

--Work- around 2: inner join before the outer join. Inner join between order  
SELECT C.CustomerId, O.OrderId, OD.ProductId, OD.Quantity  
FROM Sales.[Order] AS O

INNER JOIN Sales.OrderDetail AS OD  
ON O.OrderId = Od.OrderId  
RIGHT OUTER JOIN Sales.Customer AS C  
ON C.CustomerId = O.CustomerId  
ORDER BY C.CustomerId;

--Work- around 3: Use parenthesis. Similar to the work-around 2. Parenthesis  
SELECT C.CustomerId, O.OrderId, OD.ProductId, OD.Quantity  
FROM Sales.Customer AS C

LEFT OUTER JOIN  
(Sales.[Order] AS O  
INNER JOIN Sales.OrderDetail AS OD  
ON O.OrderID = OD.OrderId)  
ON O.CustomerId = C.CustomerId  
ORDER BY CustomerId;

	CustomerId	OrderId	ProductId	Quantity
473	21	10512	60	12
474	21	10347	25	10
475	21	10347	39	50
476	21	10347	40	4
477	21	10347	75	6
478	21	10386	24	15
479	21	10386	34	10
480	21	10414	19	18
481	21	10414	33	50
482	22	NULL	NULL	NULL
483	23	10763	21	40
484	23	10763	22	6
485	23	10763	24	20
486	23	10789	18	30
487	23	10789	35	15
488	23	10789	63	30
489	23	10789	68	18

USING THE COUNT AGGREGATE WITH OUTER JOINS

```
--The following query is supposed to return the count of
USE Northwinds2022TSQVLV7
SELECT C.CustomerId, COUNT(*) AS numorders
FROM Sales.Customer AS C
      LEFT OUTER JOIN Sales.[Order] AS O
      ON C.CustomerId = O.CustomerId
GROUP BY C.CustomerId;

--Rewrite this query like this:
SELECT C.CustomerId, COUNT(O.OrderId) AS numorders
FROM Sales.Customer AS C
      LEFT OUTER JOIN Sales.[Order] AS O
      ON C.CustomerId = O.CustomerId
GROUP BY C.CustomerId;
```



	CustomerId ▾	numorders ▾
19	19	8
20	20	30
21	21	7
22	22	1
23	23	5
24	24	19
25	25	15
26	26	3
27	27	6
28	28	8
29	29	5
30	30	10
31	31	9
32	32	11

	CustomerId	numorders
19	19	8
20	20	30
21	21	7
22	22	0
23	23	5
24	24	19
25	25	15
26	26	3
27	27	6
28	28	8
29	29	5
30	30	10
31	31	9
32	32	11