

Table of Contents

1. Syntax for outer joins (Left, Right, Full).....	1
2. Queries using altgeld_mart tables	3
2.1. Customers and orders	3
2.2. Products and orders	5

These are the tables we are using. The sql for these tables is in unit 04. Note that we have employees with no projects and a department with no employees and employees with no department.

z_em_dept		z_em_emp			z_em_empproj	
d_id	d_name	e_id	e_name	d_id	p_id	e_id
100	Manufacturing	1	Jones	150	ORDB-10	3
150	Accounting	2	Martin	150	ORDB-10	5
200	Marketing	3	Gates	250	Q4-SALES	2
250	Research	4	Anders	100	Q4-SALES	4
		5	Bossy		ORDB-10	2
		6	Perkins		Q4-SALES	5

1. Syntax for outer joins (Left, Right, Full)

Outer joins can use the syntax Left Join or Right Join. A left outer join written as

```
From tblA LEFT JOIN tblB
```

will include all rows from table tblA and any matching rows from tblB. The table to the left of the phrase Left Join will have all of its rows returned.

A right outer join written as

```
From tblA RIGHT JOIN tblB
```

will include all rows from table tblB and any matching rows from tblA. The table to the right of the phrase Right Join will have all of its rows returned.

The outer joins are not symmetric.

The word OUTER is optional; you can use Left Outer Join or Left Join.

You will still need to identify the joining columns and code the join phrase.

Demo 01: All departments; employees of those departments if they exist.

```
select z_em_dept.d_id, d_name, e_id, e_name
from z_em_dept
LEFT JOIN z_em_emp on z_em_dept.d_id = z_em_emp.d_id
;
+-----+-----+-----+-----+
| d_id | d_name      | e_id | e_name |
+-----+-----+-----+-----+
| 100 | Manufacturing | 4    | Anders |
| 150 | Accounting   | 1    | Jones  |
| 150 | Accounting   | 2    | Martin |
| 200 | Marketing    | NULL | NULL   |
| 250 | Research     | 3    | Gates  |
+-----+-----+-----+-----+
```

Demo 02: All employees; assigned departments if they exist. Outer joins are not commutative

```

select d_id, d_name, e_id, e_name
from z_em_emp
LEFT JOIN z_em_dept using(d_id);
+-----+-----+-----+-----+
| d_id | d_name      | e_id | e_name |
+-----+-----+-----+-----+
| 150 | Accounting  | 1    | Jones  |
| 150 | Accounting  | 2    | Martin |
| 250 | Research    | 3    | Gates  |
| 100 | Manufacturing | 4    | Anders |
| NULL | NULL        | 5    | Bossy  |
| NULL | NULL        | 6    | Perkins |
+-----+-----+-----+-----+

```

Demo 03: All employees; assigned departments if they exist.

```

select d_id, d_name, e_id, e_name
from z_em_dept
RIGHT JOIN z_em_emp using(d_id)
;
+-----+-----+-----+-----+
| d_id | d_name      | e_id | e_name |
+-----+-----+-----+-----+
| 150 | Accounting  | 1    | Jones  |
| 150 | Accounting  | 2    | Martin |
| 250 | Research    | 3    | Gates  |
| 100 | Manufacturing | 4    | Anders |
| NULL | NULL        | 5    | Bossy  |
| NULL | NULL        | 6    | Perkins |
+-----+-----+-----+-----+

```

MySQL does not yet support the Full Outer join syntax that you might know from another dbms.

Demo 04: Three table outer join. This is all of the departments and their employees if there are any in the department and the projects if the employees have a project.

```

select d_id, d_name, e_id, e_name, p_id
from z_em_dept
LEFT JOIN z_em_emp using(d_id)
LEFT JOIN z_em_empproj using(e_id);
+-----+-----+-----+-----+-----+
| d_id | d_name      | e_id | e_name | p_id |
+-----+-----+-----+-----+-----+
| 100 | Manufacturing | 4    | Anders | Q4-SALES |
| 150 | Accounting    | 1    | Jones  | NULL      |
| 150 | Accounting    | 2    | Martin | Q4-SALES |
| 150 | Accounting    | 2    | Martin | ORDB-10  |
| 200 | Marketing     | NULL | NULL   | NULL      |
| 250 | Research      | 3    | Gates  | ORDB-10  |
+-----+-----+-----+-----+-----+

```

Demo 05: Three table outer join. This is all of the employees and their departments if they have one and their projects if they have one

```

select e_id, e_name, d_id, d_name, p_id
from z_em_emp
LEFT JOIN z_em_dept using(d_id)
LEFT JOIN z_em_empproj using(e_id)
order by z_em_emp.e_id
;

```

e_id	e_name	d_id	d_name	p_id
1	Jones	150	Accounting	NULL
2	Martin	150	Accounting	Q4-SALES
2	Martin	150	Accounting	ORDB-10
3	Gates	250	Research	ORDB-10
4	Anders	100	Manufacturing	Q4-SALES
5	Bossy	NULL	NULL	ORDB-10
5	Bossy	NULL	NULL	Q4-SALES
6	Perkins	NULL	NULL	NULL

Demo 06: Suppose we want to see all employees and their departments if they have one and the names of their projects if they have one. The following query does not do that. We start with an outer join but then use an inner join which eliminates employees with no projects.

```
select z_em_emp.e_id, e_name, z_em_dept.d_id, d_name, p_id
from z_em_emp
LEFT JOIN z_em_dept on z_em_dept.d_id = z_em_emp.d_id
JOIN z_em_empproj on z_em_emp.e_id = z_em_empproj.e_id
order by z_em_emp.e_id;
```

e_id	e_name	d_id	d_name	p_id
2	Martin	150	Accounting	ORDB-10
2	Martin	150	Accounting	Q4-SALES
3	Gates	250	Research	ORDB-10
4	Anders	100	Manufacturing	Q4-SALES
5	Bossy	NULL	NULL	ORDB-10
5	Bossy	NULL	NULL	Q4-SALES

2. Queries using altgeld_mart tables

2.1. Customers and orders

Demo 07: Customers with orders. This uses an inner join. The cust_id filter is to reduce the volume of output.

```
select cust_id, cust_name_last, ord_id
from a_oe.customers
JOIN a_oe.order_headers using(cust_id)
where cust_id between 404900 and 409030
order by cust_id, ord_id;
```

cust_id	cust_name_last	ord_id
404900	Williams	520
404950	Morris	110
404950	Morris	408
404950	Morris	411
404950	Morris	510
404950	Morris	535
404950	Morris	540
405000	Day	116
408770	Clay	405
409030	Mazur	128
409030	Mazur	130
409030	Mazur	324

12 rows in set (0.03 sec)

Demo 08: Customers with and without orders. This uses an outer join; Customers Left Join Order Headers. That means we get customers with orders and if the customer has several orders, that customer gets multiple lines in the result set.

We also get rows for the two customers in this cust_id range who have no orders and the column for their order id value is null- these customers each get one row.

```
select cust_id
, cust_name_last
, ord_id
from a_oe.customers
LEFT JOIN a_oe.order_headers using(cust_id)
where cust_id between 404900 and 409030
order by cust_id, ord_id;
```

cust_id	cust_name_last	ord_id
404900	Williams	520
404950	Morris	110
404950	Morris	408
404950	Morris	411
404950	Morris	535
404950	Morris	540
404950	Morris	4510
405000	Day	116
408770	Clay	405
408777	Morris	NULL
409010	Morris	NULL
409020	Max	NULL
409030	Mazur	128
409030	Mazur	130
409030	Mazur	324

15 rows in set (0.00 sec)

Demo 09: Now consider this join. I change the join to a right join. The result set is the same as the inner join used previously. Why?

```
select cust_id
, cust_name_last
, ord_id
from a_oe.customers
RIGHT JOIN a_oe.order_headers using(cust_id)
where cust_id between 404900 and 409030
order by cust_id, ord_id;
```

cust_id	cust_name_last	ord_id
404900	Williams	520
404950	Morris	110
404950	Morris	408
404950	Morris	411
404950	Morris	510
404950	Morris	535
404950	Morris	540
405000	Day	116
408770	Clay	405
409030	Mazur	128
409030	Mazur	130
409030	Mazur	324

12 rows in set (0.03 sec)

In our database we have a foreign key in the order headers table that refers back to the customer table and to the cust_id in the customer table.

```
create table a_oe.order_headers(
  ord_id          int unsigned not null
, ord_date        datetime      not null
, cust_id         int unsigned not null
. . .
, constraint ord_cust_fk foreign key(cust_id) references a_oe.customers(cust_id)
. . . )
```

I also set the cust_id in the order headers table as Not null. This means that every row in the order headers table must have a value for the cust_id (it is Not null) and that cust_id in the order header must match a cust_id in the customers tables (foreign key reference).

The outer join in this query is asking for all orders whether or not they match a customer. But our database is set up so that every order header rows is matched with a customer. So it does not make sense to ask to see order headers rows that do not match a customer. In this case you should use an inner join. Using an outer join when it is logically impossible to return unmatched rows is inefficient. Someone reading your query would assume you have made a mistake someplace but they would not know what the mistake is- is the database badly designed and allows the entry of orders that do not belong to a customer (who pays for those orders?), or did you get the join order incorrect?

2.2. Products and orders

These are limited to products in the MUS category to reduce the volume of output

Demo 10: First an inner join- these show products which have been ordered- each product id must match a product id on an order detail row

```
select PR.prod_id, PR.prod_desc, PR.catg_id, OD.ord_id
from a_prd.products PR
join a_oe.order_details OD on PR.prod_id = OD.prod_id
where PR.catg_id in ('MUS')
order by PR.prod_id;
```

prod_id	prod_desc	catg_id	ord_id
2014	Bix Beiderbecke - Tiger Rag	MUS	218
2014	Bix Beiderbecke - Tiger Rag	MUS	413
2014	Bix Beiderbecke - Tiger Rag	MUS	518
2014	Bix Beiderbecke - Tiger Rag	MUS	525
2014	Bix Beiderbecke - Tiger Rag	MUS	552
2014	Bix Beiderbecke - Tiger Rag	MUS	715
2412	David Newman - Davey Blue	MUS	225
2412	David Newman - Davey Blue	MUS	525
2746	Charles Mingus - Blues & Politics	MUS	218
2746	Charles Mingus - Blues & Politics	MUS	525
2747	Charles Mingus - Blues & Roots	MUS	520
2947	Ornette Coleman - Sound Grammer	MUS	225
2947	Ornette Coleman - Sound Grammer	MUS	525
2984	John Coltrane - Lush Life	MUS	413
2984	John Coltrane - Lush Life	MUS	518
2984	John Coltrane - Lush Life	MUS	552
2984	John Coltrane - Lush Life	MUS	715

17 rows in set (0.07 sec)

Demo 11: How many products do we have in the MUS category?

We have 11 products; looking at the previous result set, 6 of these products were sold (Several were sold on more than one order.)

```
select PR.prod_id, PR.prod_desc, PR.catg_id
from a_prd.products PR
where catg_id in ('MUS')
order by PR.prod_id;
```

prod_id	prod_desc	catg_id
2014	Bix Beiderbecke - Tiger Rag	MUS
2234	Charles Mingus - Pithecanthropus Erectus	MUS
2337	John Coltrane - Blue Train	MUS
2412	David Newman - Davey Blue	MUS
2487	Stanley Turrentine - Don't Mess With Mr. T	MUS
2746	Charles Mingus - Blues & Politics	MUS
2747	Charles Mingus - Blues & Roots	MUS
2933	David Newman - I Remember Brother Ray	MUS
2947	Ornette Coleman - Sound Grammer	MUS
2984	John Coltrane - Lush Life	MUS
2987	Stanley Turrentine - Ballads	MUS

11 rows in set (0.00 sec)

Demo 12: We can use an outer join to get both ordered and un-ordered products. I have highlighted the rows where the order id is null; those are the products that were never sold.

```
select PR.prod_id, prod_desc, catg_id, ord_id
from a_prd.products PR
LEFT JOIN a_oe.order_details OD on PR.prod_id = OD.prod_id
where catg_id in ('MUS')
order by PR.prod_id;
```

prod_id	prod_desc	catg_id	ord_id
2014	Bix Beiderbecke - Tiger Rag	MUS	218
2014	Bix Beiderbecke - Tiger Rag	MUS	413
2014	Bix Beiderbecke - Tiger Rag	MUS	518
2014	Bix Beiderbecke - Tiger Rag	MUS	525
2014	Bix Beiderbecke - Tiger Rag	MUS	552
2014	Bix Beiderbecke - Tiger Rag	MUS	715
2234	Charles Mingus - Pithecanthropus Erectus	MUS	NULL
2337	John Coltrane - Blue Train	MUS	NULL
2412	David Newman - Davey Blue	MUS	225
2412	David Newman - Davey Blue	MUS	525
2487	Stanley Turrentine - Don't Mess With Mr. T	MUS	NULL
2746	Charles Mingus - Blues & Politics	MUS	218
2746	Charles Mingus - Blues & Politics	MUS	525
2747	Charles Mingus - Blues & Roots	MUS	520
2933	David Newman - I Remember Brother Ray	MUS	NULL
2947	Ornette Coleman - Sound Grammer	MUS	225
2947	Ornette Coleman - Sound Grammer	MUS	525
2984	John Coltrane - Lush Life	MUS	413
2984	John Coltrane - Lush Life	MUS	518
2984	John Coltrane - Lush Life	MUS	552
2984	John Coltrane - Lush Life	MUS	715
2987	Stanley Turrentine - Ballads	MUS	NULL

22 rows in set (0.00 sec)

Demo 13: This query gives us rows for the same products- why are we missing values in the first column which shows the product id? Every product has a product Id!

```
select OD.prod_id, prod_desc, catg_id, ord_id
from a_prd.products PR
LEFT JOIN a_oe.order_details OD on PR.prod_id = OD.prod_id
where catg_id in ('MUS')
order by OD.prod_id;
```

prod_id	prod_desc	catg_id	ord_id
NULL	John Coltrane - Blue Train	MUS	NULL
NULL	David Newman - I Remember Brother Ray	MUS	NULL
NULL	Stanley Turrentine - Ballads	MUS	NULL
NULL	Stanley Turrentine - Don't Mess With Mr. T	MUS	NULL
NULL	Charles Mingus - Pithecanthropus Erectus	MUS	NULL
2014	Bix Beiderbecke - Tiger Rag	MUS	413
2014	Bix Beiderbecke - Tiger Rag	MUS	552
2014	Bix Beiderbecke - Tiger Rag	MUS	218
2014	Bix Beiderbecke - Tiger Rag	MUS	525
2014	Bix Beiderbecke - Tiger Rag	MUS	518
2014	Bix Beiderbecke - Tiger Rag	MUS	715
2412	David Newman - Davey Blue	MUS	225
2412	David Newman - Davey Blue	MUS	525
2746	Charles Mingus - Blues & Politics	MUS	218
2746	Charles Mingus - Blues & Politics	MUS	525
2747	Charles Mingus - Blues & Roots	MUS	520
2947	Ornette Coleman - Sound Grammer	MUS	225
2947	Ornette Coleman - Sound Grammer	MUS	525
2984	John Coltrane - Lush Life	MUS	518
2984	John Coltrane - Lush Life	MUS	413
2984	John Coltrane - Lush Life	MUS	715
2984	John Coltrane - Lush Life	MUS	552

22 rows in set (0.00 sec)

What I did is switch the column alias for the first column and for the sort key to use the order details table. If I am looking for the product id in the order details table, the products which are not ordered do not have a value for that column and display as nulls.