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This is mostly review; it can help to go back over material several times. Something that did not make sense two weeks ago might click now.

## 1. Subqueries versus Joins and Distinct

We want to know the names of all of our customers who currently have an order in our order headers table. Since we need the customer name we need the customer table. We only want customers with orders so we use an inner join to the order headers table. We were not asked to check that the order has any detail lines so we do not need the order details table.

### Demo 01: Using an Inner join

```
select CS.customer_name_last, CS.customer_name_first
from cust_customers CS
join oe_orderHeaders OH on CS.customer_id = OH.customer_id
order by CS.customer_name_last, CS.customer_name_first
;
```

-- sample rows-

but we do have 97 rows and only 33 customers. It is pretty clear that we have some duplicates here.

CUSTOMER_NAME_LAST	CUSTOMER_NAME_FIRST
-----	-----
Adams	Abigail
Adams	Abigail
Button	D. K.
Button	D. K.
Button	D. K.
Clay	Clem
Day	David
Hamilton	Alexis
Hamilton	Alexis
Hamilton	Alexis
Martin	Jane
. . . . .	

What we commonly do when we have duplicate output is add the Distinct modifier.

### Demo 02: Using distinct and the inner join

```
select distinct CS.customer_name_last, CS.customer_name_first
from cust_customers CS
join oe_orderHeaders OH on CS.customer_id = OH.customer_id
order by customer_name_last, customer_name_first
;
```

CUSTOMER_NAME_LAST	CUSTOMER_NAME_FIRST
-----	-----
Adams	Abigail
Button	D. K.
Clay	Clem
Day	David
Hamilton	Alexis
Martin	Jane
Martin	Joan

Mazur	Barry
McGold	Arnold
Morise	William
Morris	William
Morse	Samuel
Northrep	William
Olmsted	Frederick
Otis	Elisha
Prince	
Stevenson	James
Williams	Al
Williams	Sally

19 rows selected.

That looks better- but this is hiding some data. We know that we could have customers with the same name.

**Demo 03:** Adding the customer id to the Select. Using distinct and the inner join; we get 2 more rows. Some customers do not have any orders. If you are going to use Distinct, you might want to include a PK

```
select distinct CS.customer_name_last, CS.customer_name_first, CS.customer_id
from cust_customers CS
join oe_orderHeaders OH on CS.customer_id = OH.customer_id
order by customer_name_last, customer_name_first
;
```

CUSTOMER_NAME_LAST	CUSTOMER_NAME_FIRST	CUSTOMER_ID
Adams	Abigail	915001
Button	D. K.	004100
Clay	Clem	008770
Day	David	005000
Hamilton	Alexis	003050
Martin	Jane	009160
Martin	Joan	009150
Mazur	Barry	009030
McGold	Arnold	300300
McGold	Arnold	900300
McGold	Arnold	903000
Morise	William	002100
Morris	William	004950
Morse	Samuel	001250
Northrep	William	001890
Olmsted	Frederick	004000
Otis	Elisha	003010
Prince		009190
Stevenson	James	003100
Williams	Al	004900
Williams	Sally	003000

21 rows selected.

Now we get several more rows. In this case we could find them by inspection. We have three customers with the name Arnold. McGold . We do not know if these are three different people or one or two people who registered with us more than one time. The person who develops the queries cannot make that decision. But we did expose the customer ID- maybe we should not do that. We are to display the name only.

Demo 04: We could hide the query with the custID inside a subquery and use it as the data source.

This will give use the rows we expect with Arnold McGold showing up three times. .

```
select customer_name_last, customer_name_first
from (
    select distinct CS.customer_name_last, CS.customer_name_first
    , CS.customer_id
    from cust_customers CS
    join oe_orderHeaders OH on CS.customer_id = OH.customer_id
) CS
;
```

CUSTOMER_NAME_LAST	CUSTOMER_NAME_FIRST
Stevenson	James
Morise	William
Otis	Elisha
Williams	Al
McGold	Arnold
Morse	Samuel
Day	David
Prince	
Northrep	William
Williams	Sally
Clay	Clem
Martin	Jane
McGold	Arnold
Morris	William
Adams	Abigail
Hamilton	Alexis
Olmsted	Frederick
Button	D. K.
Mazur	Barry
McGold	Arnold
Martin	Joan

21 rows selected.

Demo 05: Another solution would be to have a subquery that gets us the customer ID from the order headers table- that gives us customer with orders and then use that subquery as a filter for the outer query which uses the customers table to get the names.

```
select customer_name_last, customer_name_first
from cust_customers CS
where customer_id in
    (select customer_id
    from oe_orderHeaders )
;
```

Which of these two approaches is better? That depends on several things. Optimizers may make different plans based on the size of the tables, the presence or absence of indexes, and the distribution of data. So having a rule such as technique A is always better than technique B is not generally true.

If your dbms always does a sort if you use Distinct, then the second version might be more efficient. A sort, including a hidden sort, is generally expensive and you should avoid it when possible.

Of course there is another question- what are the business needs of the person who asked for the result (Remember users never want queries- they want results). Maybe the user really wants to see the different names of people who have orders- marketing people do odd types of sales analysis and maybe they are looking for name patterns!

## 2. OUTER JOINS- what does that null mean?

Suppose we write a query that shows the various locations for our employee departments. We want to include any department that might not have an assigned location.

Demo 06: An outer join from department to locations.

```
select
  dept_id
, dept_name
, loc_type as LocationType
from emp_departments D
left join emp_locations L on D.loc_id = L.loc_id
order by dept_id
;
```

dept_id	dept_name	LocationType
10	Administration	office
20	Marketing	warehouse
30	Development	warehouse
35	Cloud Computing	
80	Sales	warehouse
90	Shipping	
95	Logistics	
210	IT Support	office
215	IT Support	

(9 row(s) affected)

This has several rows with a null for the location type - what can that null mean in terms of the query. Try to think of the possibilities; you may have to look at the table create statements to see how this could happen.

One possibility is that the department does not have an assigned location and the dbms generated a null record due to the outer join.

If you look at the definition of the location table, the loc\_type was defined as nullable- so it might be that the department has a location but the location type is null. The result does not differentiate between these two.

If you look at the current data set, you can see that dept 35 has no assigned location; dept 215 has an assigned location, but that location has a null for the location type.

Demo 07: Let's show more columns so that we can work on this.

```
select
  dept_id
, dept_name
, l.loc_id
, loc_type as LocationType
, loc_city as City
, loc_state_province as "State/Province"
from emp_departments D
left join emp_locations L on D.loc_id = L.loc_id
order by dept_id
;
```

dept_id	dept_name	loc_id	LocationType	City	State/Province
10	Administration	1560	office	San Francisco	California
20	Marketing	1400	warehouse	Southlake	Texas
30	Development	1500	warehouse	South San Francisco	California

35	Cloud Computing	1400	warehouse	Southlake	Texas
80	Sales				
90	Shipping				
95	Logistics				
210	IT Support	1800	office	Toronto	Ontario
215	IT Support	2700		Munich	Bavaria

9 rows selected.

What we want as a result is the following:

dept_id	dept_name	LocationType	City	State/Province
10	Administration	office	San Francisco	California
20	Marketing	warehouse	Southlake	Texas
30	Development	warehouse	South San Francisco	California
35	Cloud Computing	No Site	No Site	No Site
80	Sales	warehouse	Southlake	Texas
90	Shipping	No Site	No Site	No Site
95	Logistics	No Site	No Site	No Site
210	IT Support	office	Toronto	Ontario
215	IT Support	Unknown type	Munich	Bavaria

Demo 08: We commonly use coalesce in these situations.

```

select
  dept_id
, dept_name
, coalesce(loc_type, 'Unknown type') as LocationType
, coalesce(loc_city, 'No Site') as City
, coalesce(loc_state_province, 'No Site') as "State/Province"
from emp_departments D
left join emp_locations L on D.loc_id = L.loc_id
order by dept_id
;

```

dept_id	dept_name	LocationType	City	State/Province
10	Administration	office	San Francisco	California
20	Marketing	warehouse	Southlake	Texas
30	Development	warehouse	South San Francisco	California
35	Cloud Computing	Unknown type	No Site	No Site
80	Sales	warehouse	Southlake	Texas
90	Shipping	Unknown type	No Site	No Site
95	Logistics	Unknown type	No Site	No Site
210	IT Support	office	Toronto	Ontario
215	IT Support	Unknown type	Munich	Bavaria

This works for the City and State- these are not null attributes in the location table definition so they only way there are null is if the department does not have a location. But the location type has two ways to be null. We want to handle that circumstance on the location table level. If the field in the location table is null then use the alternate display.

```

select loc_id
, coalesce(loc_type, 'UnknownType') as loc_type
, loc_city, loc_state_province
from emp_locations
;

```

If we use this as the data source- rather than using the location table directly, then in the outer query location type can be treated the same as the City and state. So just substitute the above query as a subquery in our outer join.

## Demo 09: Using the subquery as a data source

```

select
  dept_id
, dept_name
, coalesce(loc_type, 'No Site') as LocationType
, coalesce(loc_city, 'No Site') as City
, coalesce(loc_state_province, 'No Site') as "State/Province"
from emp_departments D
left join (
  select loc_id
  , coalesce(loc_type, 'UnknownType') as loc_type
  , loc_city, loc_state_province
  from emp_locations) L on D.loc_id = L.loc_id
order by dept_id
;

```

dept_id	dept_name	LocationType	City	State/Province
10	Administration	office	San Francisco	California
20	Marketing	warehouse	Southlake	Texas
30	Development	warehouse	South San Francisco	California
35	Cloud Computing	No Site	No Site	No Site
80	Sales	warehouse	Southlake	Texas
90	Shipping	No Site	No Site	No Site
95	Logistics	No Site	No Site	No Site
210	IT Support	office	Toronto	Ontario
215	IT Support	UnknownType	Munich	Bavaria