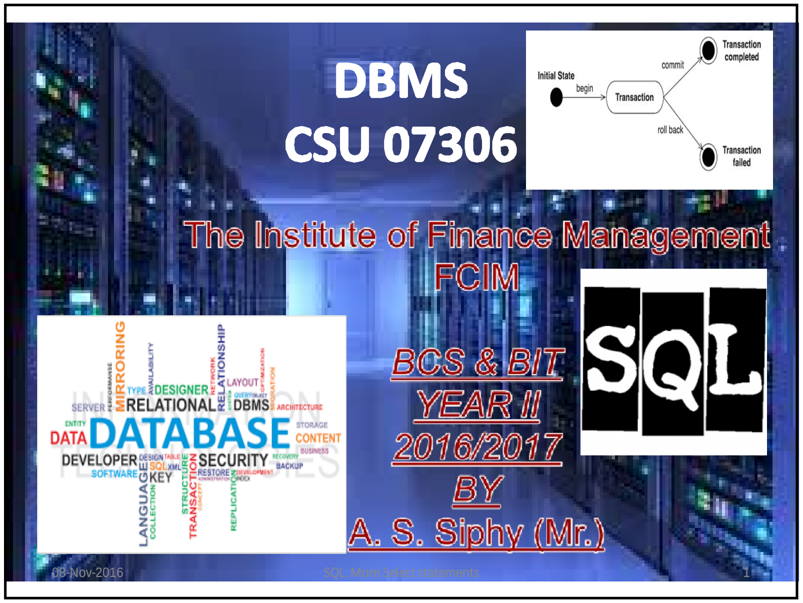
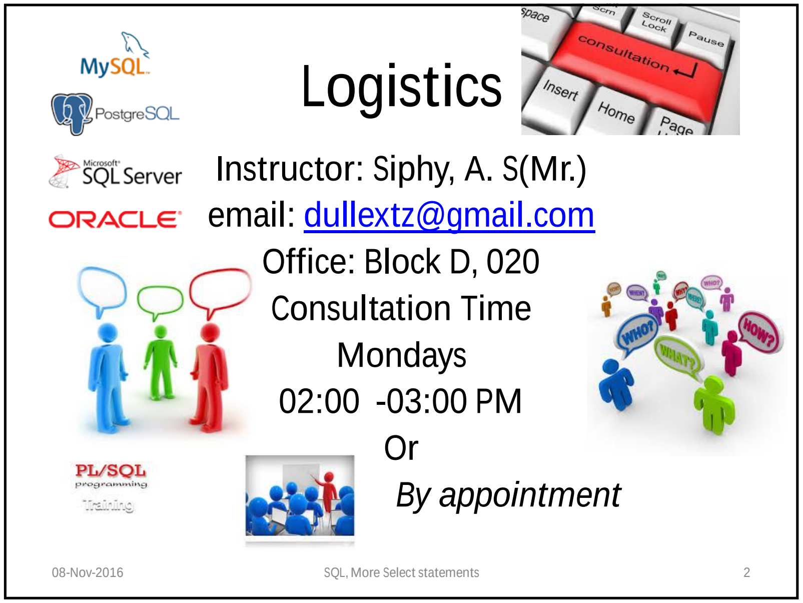


DBMS
CSU 07306

The Institute of Finance Management
FCIM

BCS & BIT
YEAR II
2016/2017
BY
A. S. Siphy (Mr.)

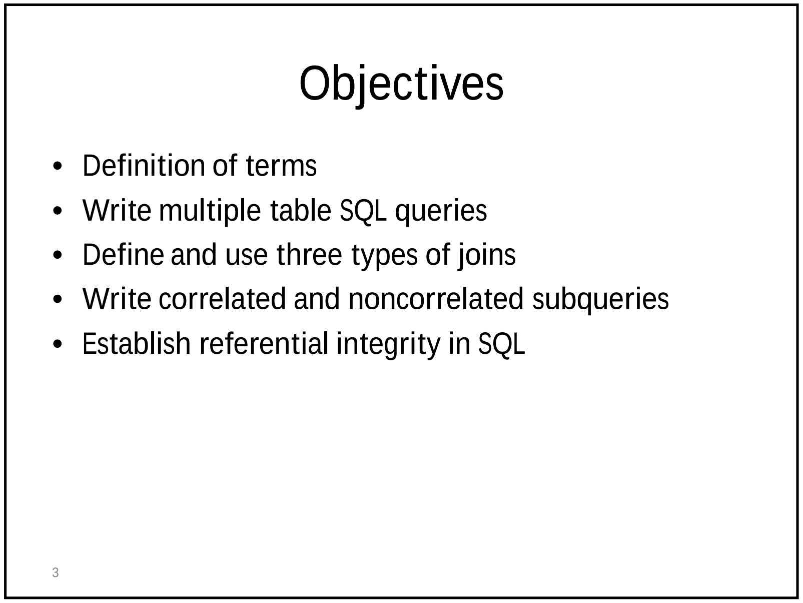
08-Nov-2016 SQL, More Select statements 1



Logistics

Instructor: Siphy, A. S(Mr.)
email: dullextz@gmail.com
Office: Block D, 020
Consultation Time
Mondays
02:00 -03:00 PM
Or
By appointment

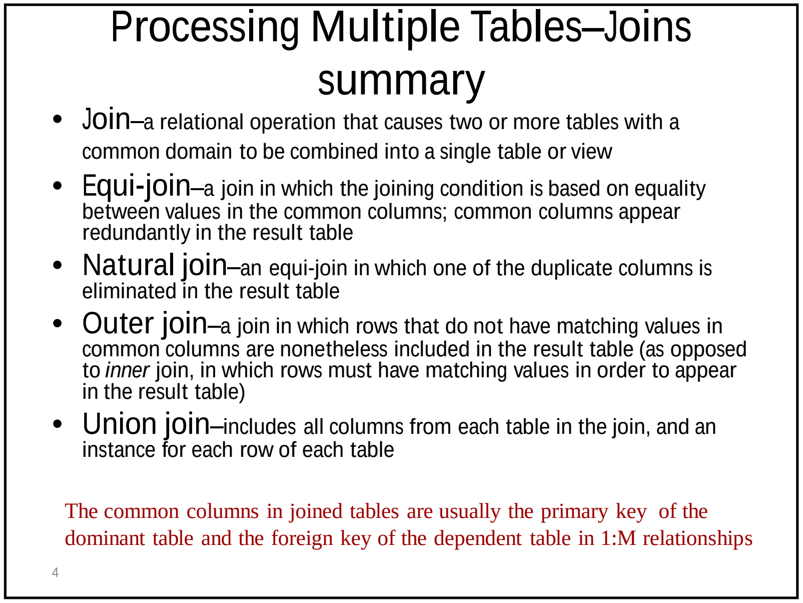
08-Nov-2016 SQL, More Select statements 2



Objectives

- Definition of terms
- Write multiple table SQL queries
- Define and use three types of joins
- Write correlated and noncorrelated subqueries
- Establish referential integrity in SQL

3



Processing Multiple Tables–Joins summary

- Join–a relational operation that causes two or more tables with a common domain to be combined into a single table or view
- Equi-join–a join in which the joining condition is based on equality between values in the common columns; common columns appear redundantly in the result table
- Natural join–an equi-join in which one of the duplicate columns is eliminated in the result table
- Outer join–a join in which rows that do not have matching values in common columns are nonetheless included in the result table (as opposed to *inner* join, in which rows must have matching values in order to appear in the result table)
- Union join–includes all columns from each table in the join, and an instance for each row of each table

The common columns in joined tables are usually the primary key of the dominant table and the foreign key of the dependent table in 1:M relationships

4

The enterprise data model

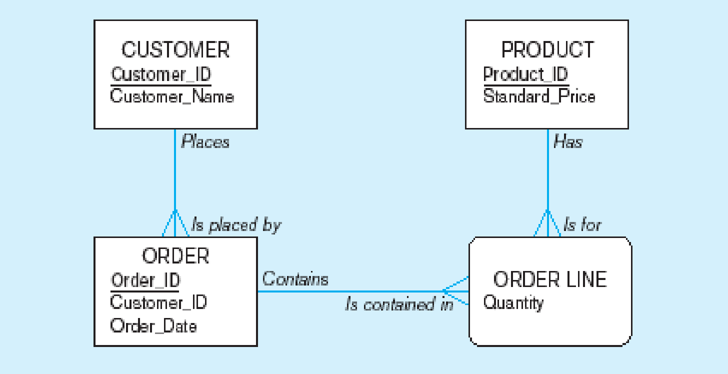
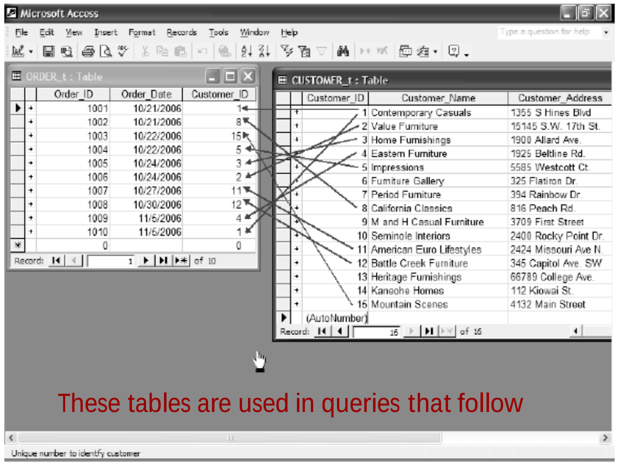


Figure 1: The Customer and Order tables with pointers from customers to their orders



ORDER_t : Table

Order_ID	Order_Date	Customer_ID
1001	10/21/2006	1
1002	10/21/2006	8
1003	10/22/2006	15
1004	10/22/2006	5
1005	10/24/2006	3
1006	10/24/2006	2
1007	10/27/2006	11
1008	10/30/2006	12
1009	11/5/2006	4
1010	11/5/2006	1
0		0

Record: 1 of 10

CUSTOMER_t : Table

Customer_ID	Customer_Name	Customer_Address
1	Contemporary Casuals	1355 S Hines Blvd
2	Value Furniture	15145 S.W. 17th St.
3	Home Furnishings	1900 Allard Ave.
4	Eastern Furniture	1925 Beltline Rd.
5	Impressions	5585 Westcott Ct.
6	Furniture Gallery	325 Flatiron Dr.
7	Period Furniture	394 Rainbow Dr.
8	California Classics	816 Peach Rd.
9	M and H Casual Furniture	3709 First Street
10	Seminole Interiors	2400 Rocky Point Dr.
11	American Euro Lifestyles	2424 Missouri Ave N.
12	Battle Creek Furniture	345 Capitol Ave. SW
13	Heritage Furnishings	66789 College Ave.
14	Kaneohe Homes	112 Kiowai St.
15	Mountain Scenes	4132 Main Street
(AutoNumber)		

Record: 16 of 16

These tables are used in queries that follow

Unique number to identify customer

Natural Join Example

- For each customer who placed an order, what is the customer’s name and order number?

Join involves multiple tables in FROM clause

```
SELECT CUSTOMER_T.CUSTOMER_ID, CUSTOMER_NAME, ORDER_ID
FROM CUSTOMER_T NATURAL JOIN ORDER_T ON
     CUSTOMER_T.CUSTOMER_ID = ORDER_T.CUSTOMER_ID;
```

ON clause performs the equality check for common columns of the two tables

Note: from Fig. 1, you see that only 10 Customers have links with orders.

➔ Only 10 rows will be returned from this INNER join.

Outer Join Example

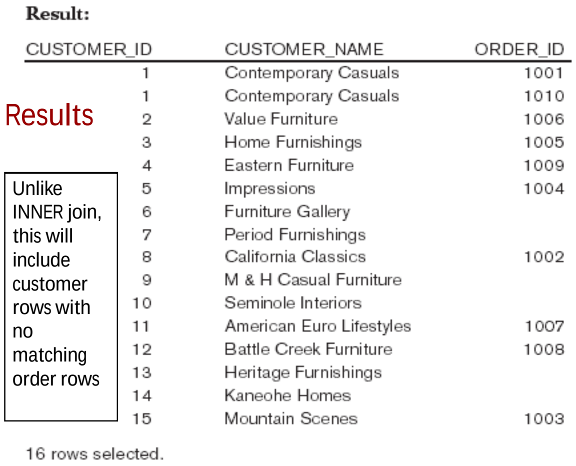
- List the customer name, ID number, and order number for all customers. Include customer information even for customers that do have an order

```
SELECT CUSTOMER_T.CUSTOMER_ID, CUSTOMER_NAME, ORDER_ID
FROM CUSTOMER_T, LEFT OUTER JOIN ORDER_T
ON CUSTOMER_T.CUSTOMER_ID = ORDER_T.CUSTOMER_ID;
```

LEFT OUTER JOIN syntax with ON causes customer data to appear even if there is no corresponding order data

Unlike INNER join, this will include customer rows with no matching order rows

Results



Result:

CUSTOMER_ID	CUSTOMER_NAME	ORDER_ID
1	Contemporary Casuals	1001
1	Contemporary Casuals	1010
2	Value Furniture	1006
3	Home Furnishings	1005
4	Eastern Furniture	1009
5	Impressions	1004
6	Furniture Gallery	
7	Period Furnishings	
8	California Classics	1002
9	M & H Casual Furniture	
10	Seminole Interiors	
11	American Euro Lifestyles	1007
12	Battle Creek Furniture	1008
13	Heritage Furnishings	
14	Kaneohe Homes	
15	Mountain Scenes	1003

16 rows selected.

Unlike INNER join, this will include customer rows with no matching order rows

Multiple Table Join Example

Four tables involved in this join

- Assemble all information necessary to create an invoice for order number 1006

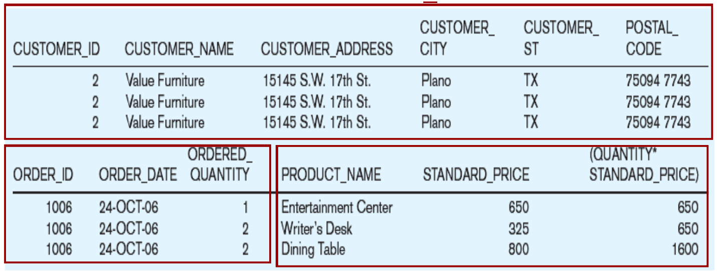
```
SELECT CUSTOMER_T.CUSTOMER_ID, CUSTOMER_NAME, CUSTOMER_ADDRESS, CITY, SATE,
    POSTAL_CODE, ORDER_T.ORDER_ID, ORDER_DATE, QUANTITY, PRODUCT_DESCRIPTION,
    STANDARD_PRICE,   (QUANTITY * UNIT_PRICE)
FROM CUSTOMER_T, ORDER_T, ORDER_LINE_T, PRODUCT_T

WHERE  CUSTOMER_T.CUSTOMER_ID = ORDER_LINE.CUSTOMER_ID           AND
            ORDER_T.ORDER_ID = ORDER_LINE_T.ORDER_ID
            AND ORDER_LINE_T.PRODUCT_ID = PRODUCT_PRODUCT_ID
            AND ORDER_T.ORDER_ID = 1006;
```

Each pair of tables requires an equality-check condition in the WHERE clause, matching primary keys against foreign keys

Figure 2: Results from a four-table join

From CUSTOMER_T table



CUSTOMER_ID	CUSTOMER_NAME	CUSTOMER_ADDRESS	CUSTOMER_ CITY	CUSTOMER_ ST	POSTAL_ CODE
2	Value Furniture	15145 S.W. 17th St.	Plano	TX	75094 7743
2	Value Furniture	15145 S.W. 17th St.	Plano	TX	75094 7743
2	Value Furniture	15145 S.W. 17th St.	Plano	TX	75094 7743

ORDER_ID	ORDER_DATE	ORDERED_ QUANTITY	PRODUCT_NAME	STANDARD_PRICE	(QUANTITY* STANDARD_PRICE)
1006	24-OCT-06	1	Entertainment Center	650	650
1006	24-OCT-06	2	Writer's Desk	325	650
1006	24-OCT-06	2	Dining Table	800	1600

From ORDER_T table

From PRODUCT_T table

Processing Multiple Tables Using Subqueries

- Subquery–placing an inner query (SELECT statement) inside an outer query
- Options:
  - In a condition of the WHERE clause
  - As a “table” of the FROM clause
  - Within the HAVING clause
- Subqueries can be:
  - Noncorrelated–executed once for the entire outer query
  - Correlated–executed once for each row returned by the outer query

Subquery Example

- Show all customers who have placed an order

The IN operator will test to see if the CUSTOMER_ID value of a row is included in the list returned from the subquery

```
    SELECT CUSTOMER_NAME    FROM CUSTOMER_T
WHERE CUSTOMER_ID IN
      (SELECT DISTINCT CUSTOMER_ID FROM ORDER_T);
```

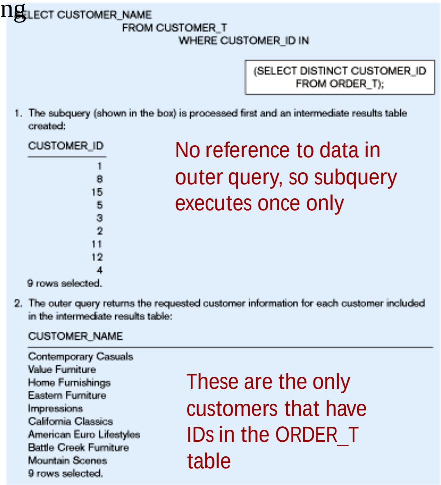
Subquery is embedded in parentheses. In this case it returns a list that will be used in the WHERE clause of the outer query

Correlated vs. Noncorrelated Subqueries

- Noncorrelated subqueries:
  - Do not depend on data from the outer query
  - Execute once for the entire outer query
- Correlated subqueries:
  - Make use of data from the outer query
  - Execute once for each row of the outer query
  - Can use the EXISTS operator

Figure 3a: Processing a noncorrelated subquery

1. The subquery executes and returns the customer IDs from the ORDER_T table
2. The outer query on the results of the subquery



```
SELECT CUSTOMER_NAME
        FROM CUSTOMER_T
            WHERE CUSTOMER_ID IN
                        (SELECT DISTINCT CUSTOMER_ID
                          FROM ORDER_T);
```

1. The subquery (shown in the box) is processed first and an intermediate results table created:

```
CUSTOMER_ID
-----------
          1
          8
         15
          5
          3
          2
         11
         12
          4
9 rows selected.
```

No reference to data in outer query, so subquery executes once only

2. The outer query returns the requested customer information for each customer included in the intermediate results table:

```
CUSTOMER_NAME
--------------------------
Contemporary Casuals
Value Furniture
Home Furnishings
Eastern Furniture
Impressions
California Classics
American Euro Lifestyles
Battle Creek Furniture
Mountain Scenes
9 rows selected.
```

These are the only customers that have IDs in the ORDER_T table

Correlated Subquery Example

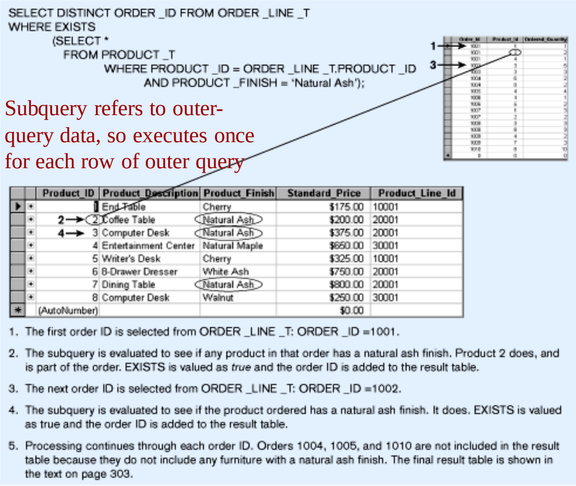
- Show all orders that include furniture finished in natural ash

The EXISTS operator will return a TRUE value if the subquery resulted in a non-empty set, otherwise it returns a FALSE

```
SELECT DISTINCT ORDER_ID FROM ORDER_LINE_T
WHERE EXISTS
    (SELECT * FROM PRODUCT_T
      WHERE PRODUCT_ID = ORDER_LINE_T.PRODUCT_ID
      AND PRODUCT_FINISH = 'Natural ash');
```

The subquery is testing for a value that comes from the outer query

Figure 3b: Processing a correlated subquery



```
SELECT DISTINCT ORDER _ID FROM ORDER _LINE _T
WHERE EXISTS
        (SELECT *
           FROM PRODUCT _T
                   WHERE PRODUCT _ID = ORDER _LINE _T.PRODUCT _ID
                           AND PRODUCT _FINISH = 'Natural Ash');
```

Order_Id	Product_Id	Ordered_Quantity
1001	1	1
1001	2	2
1001	4	1
1002	3	5
1003	3	3
1004	6	2
1004	8	2
1005	4	4
1006	4	1
1006	5	2
1007	1	3
1007	2	2
1008	3	3
1008	8	3
1009	4	2
1009	7	3
1010	8	10
0	0	0

Subquery refers to outer-query data, so executes once for each row of outer query

Product_ID	Product_Description	Product_Finish	Standard_Price	Product_Line_Id
1	End Table	Cherry	$175.00	10001
2	Coffee Table	Natural Ash	$200.00	20001
3	Computer Desk	Natural Ash	$375.00	20001
4	Entertainment Center	Natural Maple	$650.00	30001
5	Writer's Desk	Cherry	$325.00	10001
6	8-Drawer Dresser	White Ash	$750.00	20001
7	Dining Table	Natural Ash	$800.00	20001
8	Computer Desk	Walnut	$250.00	30001
(AutoNumber)			$0.00	

1. The first order ID is selected from ORDER _LINE _T: ORDER _ID =1001.
2. The subquery is evaluated to see if any product in that order has a natural ash finish. Product 2 does, and is part of the order. EXISTS is valued as *true* and the order ID is added to the result table.
3. The next order ID is selected from ORDER _LINE _T: ORDER _ID =1002.
4. The subquery is evaluated to see if the product ordered has a natural ash finish. It does. EXISTS is valued as true and the order ID is added to the result table.
5. Processing continues through each order ID. Orders 1004, 1005, and 1010 are not included in the result table because they do not include any furniture with a natural ash finish. The final result table is shown in the text on page 303.

Note: only the orders that involve products with Natural Ash will be included in the final results

Another Subquery Example

- Show all products whose standard price is higher than the average price

Subquery forms the derived table used in the FROM clause of the outer query

One column of the subquery is an aggregate function that has an alias name. That alias can then be referred to in the outer query

```
SELECT PRODUCT_DESCRIPTION, STANDARD_PRICE,  AVGPRICE
FROM
      (SELECT AVG(STANDARD_PRICE) AVGPRICE FROM PRODUCT_T),
      PRODUCT_T
      WHERE STANDARD_PRICE > AVG_PRICE;
```

The WHERE clause normally cannot include aggregate functions, but because the aggregate is performed in the subquery its result can be used in the outer query's WHERE clause

Union Queries

- Combine the output (union of multiple queries) together into a single result table

```
SELECT C1.CUSTOMER_ID,CUSTOMER_NAME,ORDERED_QUANTITY,
'Largest Quantity' QUANTITY
   FROM CUSTOMER_T C1,ORDER_T O1, ORDER_LINE_T Q1
          WHERE C1.CUSTOMER_ID =O1.CUSTOMER_ID
          AND O1.ORDER_ID =Q1.ORDER_ID
          AND ORDERED_QUANTITY =
                 (SELECT MAX(ORDERED_QUANTITY)
                 FROM ORDER_LINE_T)
```

First query

Combine →

```
UNION
SELECT C1.CUSTOMER_ID,CUSTOMER_NAME,ORDERED_QUANTITY,
'Smallest Quantity'
   FROM CUSTOMER_T C1,ORDER_T O1, ORDER_LINE_T Q1
         WHERE C1.CUSTOMER_ID =O1.CUSTOMER_ID
         AND O1.ORDER_ID =Q1.ORDER_ID
         AND ORDERED_QUANTITY =
                (SELECT MIN(ORDERED_QUANTITY)
                FROM ORDER_LINE_T)
ORDER BY ORDERED_QUANTITY;
```

Second query