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Subqueries...

www.pgrocer.net/Cis50/orasubqu.html

SUBQUERIES:

A subquery is a SELECT within a select (also called nested, sub, and inner). When the SELECT is executed, the inner SELECT is executed and the results are used to resolve the outer SELECT. Subqueries can be based on multiple tables where the result of the query on one table are used to extract data from another query. Subqueries can also be based on the same table when you want to select data in the table based on an initial conditional check of the table. The subquery can be located in a FROM, WHERE or HAVING clause and can use the tests of >, <, = , !=, >=, <=, ANY, ALL, IN. The structure of the subquery calls for the inner query which is resolved first to be enclosed in quotes. It is also important to note that the value returned from the inner select is the value that the outer select is testing on - the code must reflect this fact. The examples below show a variety of uses of the select within a select.

In the first example, I want to find out what the year goal is for someone with the last name of Ash. Once I find that out, I want to display everyone that has a year goal greater than the year goal of Ash. Notice the structure: the inner select is retrieving a yrgoal and the outer select is testing against yrgoal.

SQL CODE:

```
SQL> SELECT idno, name, yrgoal, contact
  2  FROM donor
  3  WHERE yrgoal >
  4       (SELECT yrgoal
  5        FROM donor
  6        WHERE name LIKE '%Ash');

IDNO  NAME               YRGOAL CONTACT
----- --------------- --------- ------------
11111 Stephen Daniels       500 John Smith
12121 Jennifer Ames         400 Susan Jones
```

Will work as long as only one thing is returned. If multi are returned then use IN as seen in the example below.

In the second example, the inner select comes up with all of the drive numbers where the contribution amount is greater than 20. The outer select shows information for all rows where the drive number is in the list of drives that resulted from the inner select. It is important to note the use of IN in the outer select. The inner select has a chance of returning more than one value and the outer select has to be able to deal with multiple returns. A good way of handling this is with the IN.

SQL CODE:

```
SQL> SELECT idno, driveno, contdate, contamt
  2  FROM donation
  3  WHERE driveno IN
  4      (SELECT driveno
  5       FROM donation
  6       WHERE contamt > 20);

IDNO  DRI CONTDATE    CONTAMT
----- --- --------- ---------
11111 100 07-JAN-99        25
23456 100 03-MAR-99        20
22222 100 14-MAR-99        10
12121 200 23-FEB-99        40
```

In the third example, the inner select finds the average yrgoal from the donor file and then the outer select finds all donors where the yrgoal is greater than or equal to the average. Again the inner select is returning the average for yrgoal and the outer select is testing against yrgoal.

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SQL CODE:

```
SQL> SELECT name, yrgoal
  2  FROM donor
  3  WHERE yrgoal >=
  4     (SELECT AVG(yrgoal)
  5      FROM donor);

NAME                YRGOAL
--------------- ---------
Stephen Daniels       500
Jennifer Ames         400
```

AVG() and SUM() etc return only one thing.

In the fourth example, I am using two tables. I am using the inner select to look at the donation table and select all idno where the contamt is greater than 20. The outer select than prints the name and yrgoal from the donor table for those donors that were selected by the inner select. Again, the inner select is coming up with one or more idno and the outer select is testing for a idno in the list that was retrieved.

SQL CODE:

```
1  SELECT name, yrgoal
  2  FROM donor
  3  WHERE idno IN
  4     (SELECT idno
  5      FROM donation
  6*     WHERE contamt > 20)
SQL> /

NAME                YRGOAL
--------------- ---------
Stephen Daniels       500
Jennifer Ames         400
```

Using two different tables - one for the inner select or subquery and one for the outer select.

In the fifth example, I am only using the donor table. In the inner select I am finding the average of yrgoal and then in the outer select I am showing the groups by state and contact within state where the sum of the yrgoal is greater than the average yrgoal.

SQL CODE:

```
SQL> SELECT state, contact, SUM(yrgoal)
  2  FROM donor
  3  GROUP BY state, contact
  4  HAVING SUM(yrgoal) >
  5     (SELECT AVG(yrgoal)
  6      FROM donor);

ST CONTACT      SUM(YRGOAL)
-- ------------ -----------
MA John Smith           500
RI Susan Jones          400
```

In the sixth example, I want to see information where two criteria are met. The criteria are in an AND relationship. Each of the and relationships is an inner select. For clarity, I have put selects similar to the inner selects as stand alone selects below. You will see that Stephen Daniels is the only person that meets both of the AND criteria and is therefore the only one that the outer select displays.

SQL CODE:

```
NAME               YRGOAL
--------------- ---------
Stephen Daniels       500
Jennifer Ames         400
```

In the fifth example, I am only using the donor table. In the inner select I am finding the average of yrgoal and then in the outer select I am showing the groups by state and contact within state where the sum of the yrgoal is greater than the average yrgoal.

SQL CODE:

```
SQL> SELECT state, contact, SUM(yrgoal)
  2  FROM donor
  3  GROUP BY state, contact
  4  HAVING SUM(yrgoal) >
  5     (SELECT AVG(yrgoal)
  6      FROM donor);

ST CONTACT      SUM(YRGOAL)
-- ------------ -----------
MA John Smith           500
RI Susan Jones          400
```

The inner select returns one thing and the outer select returns multiple groups.

In the sixth example, I want to see information where two criteria are met. The criteria are in an AND relationship. Each of the and relationships is an inner select. For clarity, I have put selects similar to the inner selects as stand alone selects below. You will see that Stephen Daniels is the only person that meets both of the AND criteria and is therefore the only one that the outer select displays.

SQL CODE:

```
1  SELECT name, city, state, yrgoal, contact, datefst
  2  FROM donor
  3  WHERE datefst IN
  4     (SELECT datefst
  5      FROM donor
  6      WHERE yrgoal > 100)
  7  AND state =
  8     (SELECT state
  9      FROM donor
 10*     WHERE city = 'Seekonk')
SQL> /

NAME            CITY       ST    YRGOAL CONTACT      DATEFST
--------------- ---------- -- --------- ------------ ---------
Stephen Daniels Seekonk    MA       500 John Smith   03-JUL-98
```

The examples below are showing the inner select statements from above (I added name in the select to help show which rows would be selected in each of the inner selects.

SQL CODE:

```
SQL> SELECT name, datefst
  2  FROM donor
  3  WHERE yrgoal > 100;
```

SQL CODE:

```
SELECT name, city, state, yrgoal, contact, datefst
FROM donor
WHERE datefst IN
   (SELECT datefst
    FROM donor
    WHERE yrgoal > 100)
AND state =
   (SELECT state
    FROM donor
    WHERE city = 'Seekonk')
SQL> /

NAME            CITY       ST    YRGOAL CONTACT      DATEFST
--------------- ---------- -- --------- ------------ ---------
Stephen Daniels Seekonk    MA       500 John Smith   03-JUL-98
```

Two different subqueries return two things that I then test in an AND relationship.

The examples below are showing the inner select statements from above (I added name in the select to help show which rows would be selected in each of the inner selects.

SQL CODE:

```
SQL> SELECT name, datefst
  FROM donor
  WHERE yrgoal > 100;

NAME            DATEFST
--------------- ---------
Stephen Daniels 03-JUL-98
Jennifer Ames   24-MAY-97

SQL> SELECT name, state
  FROM donor
  WHERE city = 'Seekonk';

NAME            ST
--------------- --
Stephen Daniels MA

SQL>
```

In the seventh example, I what to select all colums from donor in the outer select where the contact is in the list that the first inner select comes up with OR the contact is in the list that the second inner select comes up with. Again I showed the two inner selects separately below to show what contact would be selected by each.

SQL CODE:

```
SQL> SELECT *
  FROM donor
  WHERE contact IN
   (SELECT contact
    FROM donor
    WHERE state = 'RI')
  OR
```

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selects separately below to show what contact would be selected by each.

SQL CODE:

Now the outer where compares two things in an OR relationship. Each one involves a subquery.

```
SQL> SELECT *
  2  FROM donor
  3  WHERE contact IN
  4    (SELECT contact
  5     FROM donor
  6     WHERE state = 'RI')
  7  OR
  8    contact IN
  9    (SELECT contact
 10     FROM donor
 11     WHERE yrgoal > 100);

IDNO  NAME            STADR           CITY       ST ZIP   DATEFST      YRGOAL CONTACT
----- --------------- --------------- ---------- -- ----- --------- --------- ------------
11111 Stephen Daniels 123 Elm St      Seekonk    MA 02345 03-JUL-98       500 John Smith
12121 Jennifer Ames   24 Benefit St   Providence RI 02045 24-MAY-97       400 Susan Jones
22222 Carl Hersey     24 Benefit St   Providence RI 02045 03-JAN-98           Susan Jones
```

The two selects below are the same as the inner selects in the example above.

SQL CODE:

```
SQL> SELECT contact
  2  FROM donor
  3  WHERE state = 'RI';

CONTACT
------------
Susan Jones
Susan Jones

SQL> SELECT contact
  2  FROM donor
  3  WHERE yrgoal > 100;

CONTACT
------------
John Smith
Susan Jones

SQL>
```

In the eighth example, I am using ALL in the outer select. The inner select comes back with the minimum yrgoal grouped by state. The outer select then gives the information about any donor that is greater than the minimum in ALL of the states.

SQL CODE:

```
1  SELECT *
  2  FROM donor
  3  WHERE yrgoal > ALL
```

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```
John Smith
Susan Jones

SQL>
```

In the eighth example, I am using ALL in the outer select. The inner select comes back with the minimum yrgoal grouped by state. The outer select then gives the information about any donor that is greater than the minimum in ALL of the states.

SQL CODE:

```
1  SELECT *
  2  FROM donor
  3  WHERE yrgoal > ALL
  4     (SELECT MIN(yrgoal)
  5      FROM donor
  6*     GROUP BY state)
SQL> /

IDNO  NAME            STADR           CITY       ST ZIP   DATEFST      YRGOAL CONTACT
----- --------------- --------------- ---------- -- ----- --------- --------- -----------
11111 Stephen Daniels 123 Elm St      Seekonk    MA 02345 03-JUL-98       500 John Smith
```

Since I am grouping by I return a min for each state. I then what to compare yrgoal to ALL of the returns. Below I compare using ANY.

In the ninth example, I am using ANY in the outer select. The inner select comes back with the minimum yrgoal grouped by state. The outer select then gives the information about any donor that is greater than the minimum of ANY one of the states.

SQL CODE:

```
SQL> SELECT *
  2  FROM donor
  3  WHERE yrgoal > ANY
  4     (SELECT MIN(yrgoal)
  5      FROM donor
  6      GROUP BY state);

IDNO  NAME            STADR           CITY       ST ZIP   DATEFST      YRGOAL CONTACT
----- --------------- --------------- ---------- -- ----- --------- --------- ------------
11111 Stephen Daniels 123 Elm St      Seekonk    MA 02345 03-JUL-98       500 John Smith
12121 Jennifer Ames   24 Benefit St   Providence RI 02045 24-MAY-97       400 Susan Jones
23456 Susan Ash       21 Main St      Fall River MA 02720 04-MAR-92       100 Amy Costa
```

In the tenth example, I am again using two tables. Here I am displaying all of the information from the donation table where the contamt than any of the amounts selected by the inner select. The inner select divides yrgoal by 3 and then takes the minimum of these for each state group.

SQL CODE:

```
1  SELECT *
  2  FROM donation
  3  WHERE contamt > ANY
  4     (SELECT MIN(yrgoal/3)
  5      FROM donor
  6*     GROUP BY state)
SQL> /

IDNO  DRI CONTDATE    CONTAMT
```

```
---- --------------- --------- --------- --------- --------- --------- -- -- ----
1111 Good Night Moon        24        30        40         8     12.99 BK BY X100
1212 Heidi                  12        25        25        10     14.99 BK CH X112
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
2345 Doll House              2         5        10        45     55.98 TY CH Z212
3333 Basketball             24        25        50        14     17.99 SP BK Y200
3456 Net/Hoop               10         0        25        25     27.95 SP BK Y200

8 rows selected.

SQL> desc inven
 Name                            Null?    Type
 ------------------------------- -------- ----
 ITEMNO                                   VARCHAR2(4)
 ITEMNAME                                 VARCHAR2(15)
 ONHAND                                   NUMBER(5)
 ONORDER                                  NUMBER(5)
 REORDPT                                  NUMBER(5)
 COST                                     NUMBER(6,2)
 PRICE                                    NUMBER(6,2)
 DEPT                                     CHAR(2)
 ITEMCLASS                                CHAR(2)
 LOCATION                                 VARCHAR2(4)
```

With multiple-column subqueries you can have pairwise comparisons and nonpairwise comparisons. My understanding is that a pairwise comparison says that each candidate row in the outer select statement must match the criteria in a particular record or row that was selected by the first select. The example below shows a pairwise comparison where I want all the records that have the same dept and itemclass as those selected in the inner query. To clarify, I showed a second select that is a standalone version of the inner select so that you can see the results of the inner select. As you can see, the inner select came up with three combinations of dept and item class that met the criteria. The outer select then selects all rows that have one of those three combinations (actually there are only two distinct combinations, the third matches the second).

SQL CODE:

```
SQL> select * from inven where (dept, itemclass) in
  2  (select dept, itemclass from inven where reordpt >=25 and price > 15);

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
3333 Basketball             24        25        50        14     17.99 SP BK Y200
3456 Net/Hoop               10         0        25        25     27.95 SP BK Y200
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
2345 Doll House              2         5        10        45     55.98 TY CH Z212

SQL> select dept, itemclass from inven where reordpt >= 25 and price > 15;

DE IT
-- --
TY CH
SP BK
SP BK
```

In this example, I am asking for all records where the dept is in the group selected from the first inner select and the itemclass is in the group selected by the second inner select. Again, I ran the inner selects separately so you can see the results. The resolution of this select is that I want all rows/records where dept is either BK, TY, or SP (results of first inner select) AND itemclass is either CH or BK (results of second inner select). The major difference is that I am not matching to a single record, I am matching to the results from all of the records.

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```
---- --------------- --------- --------- --------- --------- --------- -- -- ----
1111 Good Night Moon        24        30        40         8     12.99 BK BY X100
1212 Heidi                  12        25        25        10     14.99 BK CH X112
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
2345 Doll House              2         5        10        45     55.98 TY CH Z212
3333 Basketball             24        25        50        14     17.99 SP BK Y200
3456 Net/Hoop               10         0        25        25     27.95 SP BK Y200

8 rows selected.

SQL> desc inven
 Name                            Null?    Type
 ------------------------------- -------- ----
 ITEMNO                                   VARCHAR2(4)
 ITEMNAME                                 VARCHAR2(15)
 ONHAND                                   NUMBER(5)
 ONORDER                                  NUMBER(5)
 REORDPT                                  NUMBER(5)
 COST                                     NUMBER(6,2)
 PRICE                                    NUMBER(6,2)
 DEPT                                     CHAR(2)
 ITEMCLASS                                CHAR(2)
 LOCATION                                 VARCHAR2(4)
```

This record meets the criteria of reordpt >= 25 and price > 15 so it returns SPBK which then finds all records with SPBK.

With multiple-column subqueries you can have pairwise comparisons and nonpairwise comparisons. My understanding is that a pairwise comparison says that each candidate row in the outer select statement must match the criteria in a particular record or row that was selected by the first select. The example below shows a pairwise comparison where I want all the records that have the same dept and itemclass as those selected in the inner query. To clarify, I showed a second select that is a standalone version of the inner select so that you can see the results of the inner select. As you can see, the inner select came up with three combinations of dept and item class that met the criteria. The outer select then selects all rows that have one of those three combinations (actually there are only two distinct combinations, the third matches the second).

SQL CODE:

```
SQL> select * from inven where (dept, itemclass) in
  2  (select dept, itemclass from inven where reordpt >=25 and price > 15);

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
3333 Basketball             24        25        50        14     17.99 SP BK Y200
3456 Net/Hoop               10         0        25        25     27.95 SP BK Y200
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
2345 Doll House              2         5        10        45     55.98 TY CH Z212

SQL> select dept, itemclass from inven where reordpt >= 25 and price > 15;

DE IT
-- --
TY CH
SP BK
SP BK
```

In this example, I am asking for all records where the dept is in the group selected from the first inner select and the itemclass is in the group selected by the second inner select. Again, I ran the inner selects separately so you can see the results. The resolution of this select is that I want all rows/records where dept is either BK, TY, or SP (results of first inner select) AND itemclass is either CH or BK (results of second inner select). The major difference is that I am not matching to a single record, I am matching to the results from all of the records.

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```
-- --
TY CH
SP BK
SP BK
```

In this example, I am asking for all records where the dept is in the group selected from the first inner select and the itemclass is in the group selected by the second inner select. Again, I ran the inner selects separately so you can see the results. The resolution of this select is that I want all rows/records where dept is either BK, TY, or SP (results of first inner select) AND itemclass is either CH or BK (results of second inner select). The major difference is that I am not matching to a single record, I am matching to the results from all of the records.

SQL CODE:

```
SQL> select * from inven where dept in
  2  (select dept from inven where reordpt >=25)
  3  and itemclass in
  4  (select itemclass from inven where price > 15);

ITEM ITEMNAME            ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
3333 Basketball             24        25        50        14     17.99 SP BK Y200
3456 Net/Hoop               10         0        25        25     27.95 SP BK Y200
1212 Heidi                  12        25        25        10     14.99 BK CH X112
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
2345 Doll House              2         5        10        45     55.98 TY CH Z212

7 rows selected.


SQL> select dept from inven where reordpt >=25;

DE
--
BK
BK
TY
SP
SP

SQL> select itemclass from inven where price > 15;

IT
--
CH
CH
CH
BK
BK

SQL>
  1   select * from inven where dept in
  2   (select dept from inven where reordpt >=25 and price > 15)
  3   and itemclass in
  4*  (select itemclass from inven where reordpt >=25 and price > 15)
SQL> /
```

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```
BK
BK
TY
SP
SP

SQL> select itemclass from inven where price > 15;

IT
--
CH
CH
CH
BK
BK

SQL>
  1   select * from inven where dept in
  2   (select dept from inven where reordpt >=25 and price > 15)
  3   and itemclass in
  4*  (select itemclass from inven where reordpt >=25 and price > 15)
SQL> /

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
3333 Basketball             24        25        50        14     17.99 SP BK Y200
3456 Net/Hoop               10         0        25        25     27.95 SP BK Y200
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
2345 Doll House              2         5        10        45     55.98 TY CH Z212

SQL> select dept from inven where reordpt >=25 and price > 15;

DE
--
TY
SP
SP

SQL> select itemclass from inven where reordpt >=25 and price > 15;

IT
--
CH
BK
BK
```

Another example: In this example, I want all rows/records where onhand and onorder are a match to the records in itemclass CH. On the first try, all the rows that are retrieved have CH in itemclass which indicates that there are no records that have an exact match to them. I then looked at the entire inventory and decided to change item 3456 to have an onhand of 5 and then it would be the same as item 1234. I did this and reran the select, this time item 3456 comes up because on hand and onorder match one of the records with itemclass CH. Note that in this example, I had to have onhand and onorder from the same record match.

SQL CODE:

```
  1  select * from inven where (onhand, onorder) in
  2* (select onhand, onorder from inven where itemclass='CH')
SQL> /
```

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SQL CODE:

```
  1  select * from inven where (onhand, onorder) in
  2* (select onhand, onorder from inven where itemclass='CH')
SQL> /

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
2345 Doll House              2         5        10        45     55.98 TY CH Z212
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
1212 Heidi                  12        25        25        10     14.99 BK CH X112

SQL> select * from inven;

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
1111 Good Night Moon        24        30        40         8     12.99 BK BY X100
1212 Heidi                  12        25        25        10     14.99 BK CH X112
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
2345 Doll House              2         5        10        45     55.98 TY CH Z212
3333 Basketball             24        25        50        14     17.99 SP BK Y200
3456 Net/Hoop               10         0        25        25     27.95 SP BK Y200

8 rows selected.

SQL> update inven
  2  set onhand=5 where itemno='3456';

1 row updated.

SQL> select * from inven where (onhand, onorder) in
  2  (select onhand, onorder from inven where itemclass = 'CH');

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
2345 Doll House              2         5        10        45     55.98 TY CH Z212
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
3456 Net/Hoop                5         0        25        25     27.95 SP BK Y200
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
1212 Heidi                  12        25        25        10     14.99 BK CH X112

6 rows selected.

SQL> select * from inven where onhand in
  2  (select onhand from inven where itemclass = 'CH')
  3  and onorder in
  4  (select onorder from inven where itemclass = 'CH');

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
3456 Net/Hoop                5         0        25        25     27.95 SP BK Y200
2345 Doll House              2         5        10        45     55.98 TY CH Z212
```

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More on subqueries...

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```
1 row updated.

SQL> select * from inven where onhand in
  2  (select onhand from inven where itemclass = 'CH')
  3  and onorder in
  4  (select onorder from inven where itemclass = 'CH');

ITEM ITEMNAME           ONHAND   ONORDER   REORDPT      COST     PRICE DE IT LOCA
---- --------------- --------- --------- --------- --------- --------- -- -- ----
2222 Building Blocks         4         0        15        23     27.98 TY CH Z200
1234 Adven Reddy Fox         5         0        10         9     14.75 BK CH X100
3456 Net/Hoop               12         0        25        25     27.95 SP BK Y200
2345 Doll House              2         5        10        45     55.98 TY CH Z212
2121 Teddy Bear              5        20        40        15     19.95 TY CH X115
1212 Heidi                  12        25        25        10     14.99 BK CH X112

6 rows selected.
```

Problems with null values in a subquery: Important to read this.

There is a problem with null values in a subquery. If one of the value returned when the inner query is executed is null then no rows are returned. Since all conditions that compare a null value produce a null you should not use the NOT IN which is the same as !=ALL in the query. You can use the the NVL to get around this. In the example below, the inner select takes all manager numbers from the table test null. I now want a list of all rows/records where the idno is not in the group selected. Logically I should have gotton results, but because of the way the null works, I did not. In the second example, I said that null values should be replaced with 0000 and now I got a list of all the employees whose idno was not in the manager column. In other words I got a list of all people that are not managers because those are the people who have a manager number listed in the manager column.

SQL CODE:

```
SQL> select * from testnull;

IDNO NAME            MANG DE
---- --------------- ---- --
1111 John Doe        2222 AB
1212 Kevin Adams     3333 XY
2222 Linda Richmond       AB
3333 Richard Wilson       XY
3456 Susan Anders    3333 XY

SQL> select *
  2  from testnull
  3  where idno NOT IN
  4  (select mangr from testnull);

no rows selected

SQL> select * from testnull
  2  where idno NOT IN
  3  (select NVL(mangr,'0000') from testnull);

IDNO NAME            MANG DE
---- --------------- ---- --
1111 John Doe        2222 AB
1212 Kevin Adams     3333 XY
3456 Susan Anders    3333 XY
```

Type here to search

10:06 AM 9/24/2019

```
      7900 JAMES      CLERK           7698 03-DEC-81        950
        30


     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM
---------- ---------- --------- ---------- --------- ---------- ----------
    DEPTNO
----------
      7902 FORD       ANALYST         7566 03-DEC-81       3000
        20

      7934 MILLER     CLERK           7782 23-JAN-82       1300
        10


SQL> select * from dept;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON

SQL> desc dept;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DEPTNO                                    NOT NULL NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)
```

What output would be produced

```
SQL> select empno, ename, deptno, sal, job
  2  from emp
  3  where deptno in
  4      (select deptno
  5         from dept
  6         where dname in ('RESEARCH','SALES'));
```

Problem 3: Determine the output

```
SQL> desc courseinfo;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 CRSNO                                              VARCHAR2(4)
 CRSNAME                                            VARCHAR2(25)
 CAPACITY                                           NUMBER(3)
 ENROLLED                                           NUMBER(3)
```

```
SQL> select * from courseinfo;
```

subqueryquizF16-1 (Protected View) - Word

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PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing

```
      7900 JAMES      CLERK           7698 03-DEC-81        950
        30

     EMPNO ENAME      JOB              MGR HIREDATE         SAL
---------- ---------- --------- ---------- --------- ----------
    DEPTNO
----------
      7902 FORD       ANALYST         7566 03-DEC-81       3000
        20

      7934 MILLER     CLERK           7782 23-JAN-82       1300
        10

SQL> select * from dept;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON

SQL> desc dept;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------
 DEPTNO                                    NOT NULL NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)
```

What output would be produced

```
SQL> select empno, ename, deptno, sal, job
  2  from emp
  3  where deptno in
  4      (select deptno
  5         from dept
  6         where dname in ('RESEARCH','SALES
```

Problem 3: Determine the output

```
SQL> desc courseinfo;
 Name                                      Null?    T
 ----------------------------------------- -------- -------------------------
 CRSNO                                              VARCHAR2(4)
 CRSNAME                                            VARCHAR2(25)
 CAPACITY                                           NUMBER(3)
 ENROLLED                                           NUMBER(3)
```

```
SQL> select * from courseinfo;
```

pgrocer@cisweb:~

```
SQL> desc dept;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DEPTNO                                    NOT NULL NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)

SQL> select deptno from dept
  2  where dname in ('RESEARCH','SALES');

    DEPTNO
----------
        20
        30

SQL> select empno, ename, deptno, sal, job from emp
  2  where deptno in
  3     (select deptno from dept
  4      where dname in ('RESEARCH','SALES'));

     EMPNO ENAME          DEPTNO        SAL JOB
---------- ---------- ---------- ---------- ---------
      7566 JONES              20       2975 MANAGER
      7902 FORD               20       3000 ANALYST
      7876 ADAMS              20       1100 CLERK
      7369 SMITH              20        800 CLERK
      7788 SCOTT              20       3000 ANALYST
      7521 WARD               30       1250 SALESMAN
      7844 TURNER             30       1500 SALESMAN
      7499 ALLEN              30       1600 SALESMAN
      7900 JAMES              30        950 CLERK
      7698 BLAKE              30       2850 MANAGER
      7654 MARTIN             30       1250 SALESMAN

11 rows selected.

SQL>
```

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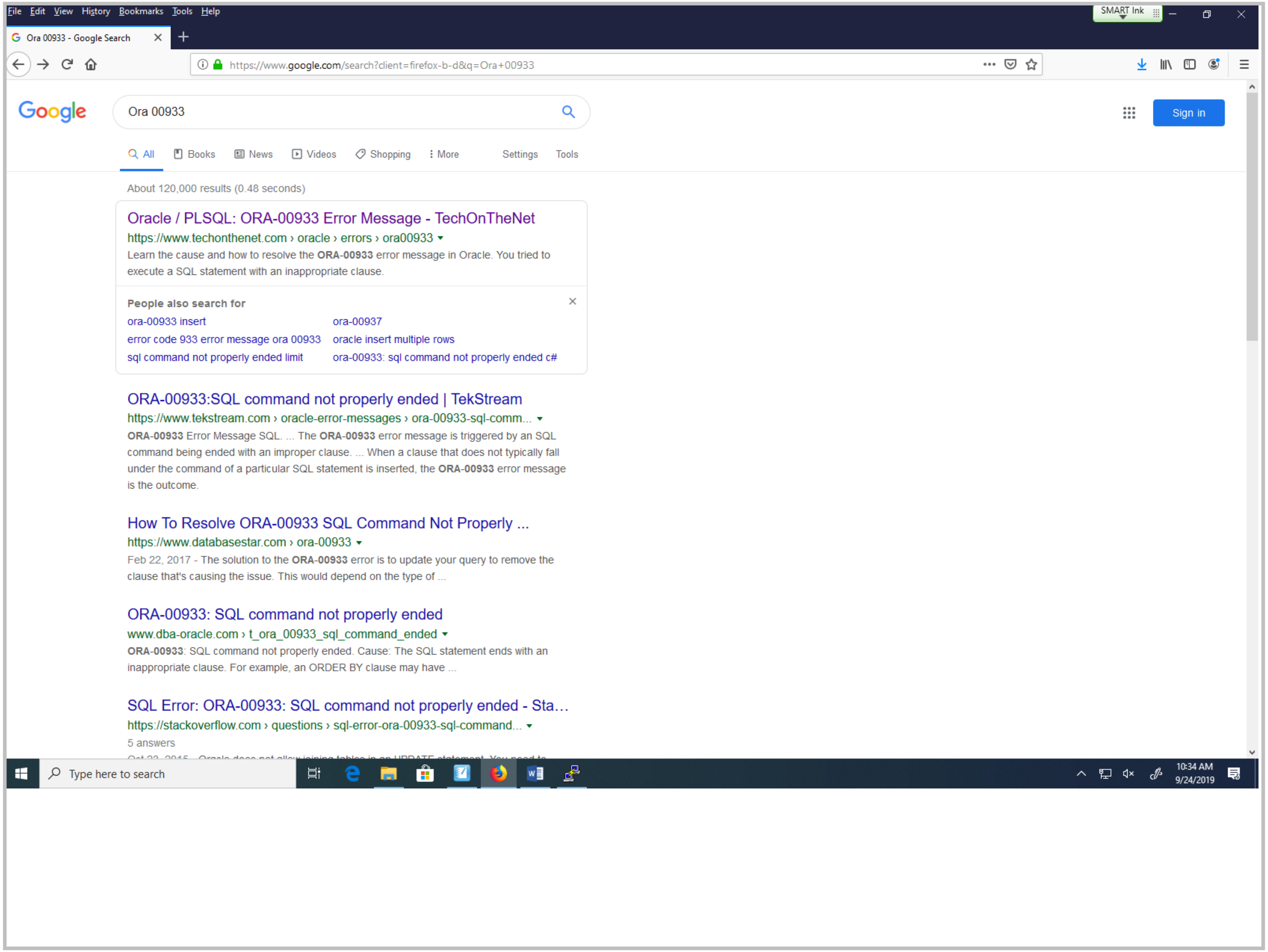
Type here to search 10:18 AM 9/24/2019

Title: Sep 24-10:18 AM (14 of 18)



Title: Sep 24-10:34 AM (15 of 18)

subqueryquizF16-1 (Protected View) - Word

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Problem 3: Determine the output

```
SQL> desc courseinfo;
 Name                                      Null?    Ty
 ----------------------------------------- -------- --
 CRSNO                                              VA
 CRSNAME                                            VA
 CAPACITY                                           NU
 ENROLLED                                           NU
```

```
SQL> select * from courseinfo;

CRSN CRSNAME                    CAPACITY   ENROLLED
---- ------------------------- ---------- ----------
CI05 C++                               30         20
CI07 VB                                32         24
CI12 Oracle                            30         27
CI17 PHP                               32         32
BU10 Management                        32         18
BU19 Sales                             25         20
BU23 Accounting                        30         21

7 rows selected.

SQL> select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5    (select avg(enrolled)
  6     from courseinfo);
```

Explain and show the output that would be produced.

Problem 4: Now make this change and explain and show the output that would be produced.

```
SQL> select substr(crsno,1,2), avg(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having avg(enrolled) >
  5    (select avg(enrolled)
```

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```
CI           103

SQL> select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo;)
  7
SQL> edit
Wrote file afiedt.buf

  1  select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6*     from courseinfo);
SQL> /
    from courseinfo);
                    *
ERROR at line 6:
ORA-00933: SQL command not properly ended


SQL> select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo);

SU SUM(ENROLLED)
-- -------------
BU            59
CI           103

SQL>
```

Page 2 of 6 1462 words

10:36 AM 9/24/2019

Title: Sep 24-10:36 AM (16 of 18)

Problem 3: Determine the output

```
SQL> desc courseinfo;
 Name                                      Null?    Type
 ----------------------------------------- -------- ------------
 CRSNO                                              VARCHAR2(4)
 CRSNAME                                            VARCHAR2(25)
 CAPACITY                                           NUMBER(3)
 ENROLLED                                           NUMBER(3)
```

```
SQL> select * from courseinfo;

CRSN CRSNAME                     CAPACITY   ENROLLED
---- ------------------------- ---------- ----------
CI05 C++                               30         20
CI07 VB                                32         24
CI12 Oracle                            30         27
CI17 PHP                               32         32
BU10 Management                        32         18
BU19 Sales                             25         20
BU23 Accounting                        30         21

7 rows selected.
```

```
SQL> select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo);
```

Explain and show the output that would be produced.

Problem 4: Now make this change and explain and show the output that would be produced.

```
SQL> select substr(crsno,1,2), avg(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having avg(enrolled) >
  5     (select avg(enrolled)
```

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```
  1  select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6*     from courseinfo);
SQL> /
    from courseinfo);
                    *
ERROR at line 6:
ORA-00933: SQL command not properly ended


SQL> select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo);

SU SUM(ENROLLED)
-- -------------
BU            59
CI           103

SQL> select substr(crsno,1,2), avg(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having avg(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo);

SU AVG(ENROLLED)
-- -------------
CI         25.75

SQL>
```

subqueryquizF16-1 (Protected View) - Word

PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing

Problem 3: Determine the output

```
SQL> desc courseinfo;
 Name                                      Null?    Type
 ----------------------------------------- -------- ------------
 CRSNO                                              VARCHAR2(4)
 CRSNAME                                            VARCHAR2(25)
 CAPACITY                                           NUMBER(3)
 ENROLLED                                           NUMBER(3)
```

```
SQL> select * from courseinfo;

CRSN CRSNAME                     CAPACITY   ENROLLED
---- ------------------------- ---------- ----------
CI05 C++                               30         20
CI07 VB                                32         24
CI12 Oracle                            30         27
CI17 PHP                               32         32
BU10 Management                        32         18
BU19 Sales                             25         20
BU23 Accounting                        30         21

7 rows selected.

SQL> select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo);
```

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Problem 4: Now make this change and explain and show the output that would be produced.

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  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having avg(enrolled) >
  5     (select avg(enrolled)
```

pgrocer@cisweb:~

```
                                   *
ERROR at line 6:
ORA-00933: SQL command not properly ended


SQL> select substr(crsno,1,2), sum(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having sum(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo);

SU SUM(ENROLLED)
-- -------------
BU            59
CI           103

SQL> select substr(crsno,1,2), avg(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2)
  4  having avg(enrolled) >
  5     (select avg(enrolled)
  6      from courseinfo);

SU AVG(ENROLLED)
-- -------------
CI         25.75

SQL> select substr(crsno,1,2), avg(enrolled)
  2  from courseinfo
  3  group by substr(crsno,1,2);

SU AVG(ENROLLED)
-- -------------
BU    19.6666667
CI         25.75

SQL>
```

Page 2 of 6 1462 words

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