Name: Danny Chen
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10.1 - Fundamentals of Subqueries
Vocab

Word	Definition
Outer query	It accepts a value from the inner query to complete its SELECT statement
Multiple-row subquery	An inner query that returns one or more rows to the outer query
Subquery	An inner query that is nested within an outer query
pair-wise multiple-column subquery	An inner query that compares multiple columns at the same time
Single-row subquery	An inner query that returns only one row to the outer query
non-pair-wise multiple-column subquery	An inner query that compares the multiple columns one at a time in different subqueries
Inner query	Another name for a subquery

1. What is the purpose of using a subquery?
   a. **ANS:** The purpose of a subquery is to be able to retrieve the information you need to get the information you want. You may not know the exact details needed to get the information you want, so this is where subquery comes in.
2. What is a subquery?
   a. **ANS:** A subquery is a SELECT statement that is embedded inside another query. The subquery is considered the "inner query" and executes first before its outer

component. Specifically, the outer query will use the information returned by the subquery to get the desired info.

3. What DJs on Demand d_play_list_items song_id's have the same event_id as song_id 45?

ANS:
SELECT *
FROM d_play_list_items
WHERE event_id = (
      SELECT event_id
      FROM d_play_list_items
      WHERE song_id = 45
);

EVENT_ID	SONG_ID	COMMENTS
100	45	Play late
100	46	-
100	47	Play early

4. Which events in the DJs on Demand database cost more than event_id = 100?

ANS:
SELECT name, cost
FROM d_events
WHERE cost > (
      SELECT cost
      FROM d_events
      WHERE id = 100
);

NAME	COST
Vigil wedding	10000

5. Find the track number of the song that has the same CD number as "Party Music for All Occasions."

ANS:

```
SELECT track, cd_number
FROM d_track_listings
WHERE cd_number = (
     SELECT cd_number
     FROM d_cds
     WHERE LOWER(title) = LOWER('Party Music for All Occasions')
);
```

TRACK	CD_NUMBER
2	91
3	91

6. List the DJs on Demand events whose theme code is the same as the code for "Tropical."

ANS:
```
SELECT name "Event Names", theme_code
FROM d_events
WHERE theme_code = (
   SELECT theme_code
   FROM d_themes
   WHERE LOWER(description) = LOWER('Tropical')
);
```

Event Names	THEME_CODE
Peters Graduation	200
Vigil wedding	200

7. What are the names of the Global Fast Foods staff members whose salaries are greater than the staff member whose ID is 12?

ANS:
```
SELECT first_name, last_name, salary
FROM f_staffs
WHERE salary > (
   SELECT salary
   FROM f_staffs
   WHERE id = 12
```

);

FIRST_NAME	LAST_NAME	SALARY
Bob	Miller	10
Monique	Tuttle	60

8. What are the names of the Global Fast Foods staff members whose staff types are not the same as Bob Miller's?

ANS:
SELECT first_name, last_name, staff_type
FROM f_staffs
WHERE staff_type != (
   SELECT staff_type
   FROM f_staffs
   WHERE LOWER(first_name) = LOWER('Bob')
     AND LOWER(last_name) = LOWER('Miller')
);

FIRST_NAME	LAST_NAME	STAFF_TYPE
Sue	Doe	Order Taker
Monique	Tuttle	Manager

9. Which Oracle employees have the same department ID as the IT department?

ANS:
SELECT employee_id, first_name, last_name, department_id
FROM employees
WHERE department_id = (
   SELECT department_id
   FROM departments
   WHERE UPPER(department_name) = UPPER('IT')
)

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_ID
103	Alexander	Hunold	60
104	Bruce	Ernst	60
107	Diana	Lorentz	60
222	Chen	Li	60
223	Alain	Fontaine	60

10. What are the department names of the Oracle departments that have the same location ID as Seattle?

ANS:
SELECT department_name, location_id
FROM departments
WHERE location_id = (
   SELECT location_id
   FROM locations
   WHERE LOWER(city) = LOWER('Seattle')
);

DEPARTMENT_NAME	LOCATION_ID
Administration	1700
Executive	1700
Accounting	1700
Contracting	1700

11. Indicate whether the statement regarding subqueries is True or False.
   a. It is good programming practice to place a subquery on the right side of the comparison operator.
      i. **TRUE**
   b. A subquery can reference a table that is not included in the outer query's FROM clause.
      i. **TRUE**
   c. Single-row subqueries can return multiple values to the outer query.

i.   **FALSE**

10.2 - Single-Row Subqueries
1. Write a query to return all those employees who have a salary greater than that of Lorentz and are in the same department as Abel.

ANS:
SELECT first_name, last_name, salary
FROM employees
WHERE salary > (
    SELECT salary
    FROM employees
    WHERE LOWER(last_name) = LOWER('Lorentz')
)
AND department_id = (
    SELECT department_id
    FROM employees
    WHERE LOWER(last_name) = LOWER('Abel')
)

FIRST_NAME	LAST_NAME	SALARY
Eleni	Zlotkey	10500
Ellen	Abel	11000
Jonathon	Taylor	8600
Nick	Hooper	9600

2. Write a query to return all those employees who have the same job ID as Rajs and were hired after Davies.

ANS:
SELECT first_name, last_name, hire_date
FROM employees
WHERE salary > (
    SELECT salary
    FROM employees
    WHERE LOWER(last_name) = LOWER('Rajs')
)
AND hire_date > (

SELECT hire_date
FROM employees
WHERE LOWER(last_name) = LOWER('Davies')
)

FIRST_NAME	LAST_NAME	HIRE_DATE
Eleni	Zlotkey	29-Jan-2015
Jonathon	Taylor	24-Mar-2013
Kimberely	Grant	24-May-2014
Kevin	Mourgos	16-Nov-2014
Diana	Lorentz	07-Feb-2014
Pat	Fay	17-Aug-2013
Lucas	Almeida Castro	16-Aug-2012
Nick	Hooper	01-Sep-2012
Lisa	TAYLOR	09-Feb-2013
Michael	Stocks	16-Dec-2015

3. What DJs on Demand events have the same theme code as event ID = 100?

ANS:
SELECT name "Event Name", theme_code
FROM d_events
WHERE theme_code = (
    SELECT theme_code
    FROM d_events
    WHERE id = 100
)

Event Name	THEME_CODE
Peters Graduation	200
Vigil wedding	200

4. What is the staff type for those Global Fast Foods jobs that have a salary less than those of any Cook staff-type jobs?

ANS:
SELECT staff_type
FROM f_staffs
WHERE salary < (
   SELECT salary
   FROM f_staffs
   WHERE LOWER(staff_type) = LOWER('Cook')
)

STAFF_TYPE
Order Taker

5. Write a query to return a list of department IDs and average salaries where the department's average salary is greater than Ernst's salary.

ANS:
SELECT department_id, ROUND(AVG(salary), 2) "Average Salary by Dept"
FROM employees
GROUP BY department_id
HAVING AVG(salary) > (
   SELECT salary
   FROM employees
   WHERE last_name = 'Ernst'
)
ORDER BY department_id;

DEPARTMENT_ID	Average Salary by Dept
20	6157.14
60	7000
80	9925
85	7900
90	19333.33
110	7800
-	7000

7 rows returned in 0.00 seconds   Download

6. Return the department ID and minimum salary of all employees, grouped by department ID, having a minimum salary greater than the minimum salary of those employees whose department ID is not equal to 50.

ANS:
SELECT department_id, MIN(salary) "Min salary by dept"
FROM employees
GROUP BY department_id
HAVING MIN(salary) > (
    SELECT MIN(salary)
    FROM employees
    WHERE department_id != 50
)
ORDER BY department_id

DEPARTMENT_ID	Min salary by dept
10	4100
60	4200
80	8600
85	7300
90	17000
110	5200
-	7000

7 rows returned in 0.01 seconds   Download

10.3 - Multiple-Row Subqueries
1. What will be returned by a query if it has a subquery that returns a null?
    a. **ANS:** The query will also return null b/c comparing anything to a null results in null
2. Write a query that returns jazz and pop songs. Write a multi-row subquery and use the d_songs and d_types tables. Include the id, title, duration, and the artist name.

ANS:
SELECT id, title, duration, artist
FROM d_songs
WHERE type_code IN (
    SELECT code

FROM d_types
WHERE LOWER(description) IN ('jazz', 'pop')
)

ID	TITLE	DURATION	ARTIST
48	Meet Me At the Altar	6 min	Bobby West
45	Its Finally Over	5 min	The Hobbits
46	Im Going to Miss My Teacher	2 min	Jane Pop

3 rows returned in 0.01 seconds   Download

3. Find the last names of all employees whose salaries are the same as the minimum salary for any department.

ANS:
SELECT last_name
FROM employees
WHERE salary IN (
    SELECT MIN(salary)
    FROM employees
    GROUP BY department_id
)

LAST_NAME	SALARY
Kochhar	17000
De Haan	17000
Taylor	8600
Grant	7000
Vargas	2500
Lorentz	4200
Alves Rocha	7300
Almeida Castro	7300
Steiner	8600
Stocks	3700
Ricci	4100
Loermans	5200

4. Which Global Fast Foods employee earns the lowest salary? **Hint**: You can use either a singlerow or a multiple-row subquery

ANS:
SELECT first_name, last_name, salary
FROM employees
WHERE salary = (
    SELECT MIN(salary)
    FROM employees
)

FIRST_NAME	LAST_NAME	SALARY
Peter	Vargas	2500

1 rows returned in 0.01 seconds   Download

5. Place the correct multiple-row comparison operators in the outer query WHERE clause of each of the following:

a. Which CDs in our d_cds collection were produced before "Carpe Diem" was produced?
WHERE year _____<____ (SELECT year ...

b. Which employees have salaries lower than any one of the programmers in the IT department?
WHERE salary _____< ANY____(SELECT salary ...

c. What CD titles were produced in the same year as "Party Music for All Occasions" or "Carpe Diem"?
WHERE year ____IN_____(SELECT year ...

d. What song title has a duration longer than every type code 77 title?
WHERE duration ___> ALL_____(SELECT duration …

6. If each WHERE clause is from the outer query, which of the following are true?
   a. WHERE size > ANY -- If the inner query returns sizes ranging from 8 to 12, the value 9 could be returned in the outer query.
   b. WHERE book_number IN -- If the inner query returns books numbered 102, 105, 437, and 225 then 325 could be returned in the outer query.
   c. WHERE score <= ALL -- If the inner query returns the scores 89, 98, 65, and 72, then 82 could be returned in the outer query.
   d. WHERE color NOT IN -- If the inner query returns red, green, blue, black, and then the outer query could return white.
   e. WHERE game_date = ANY -- If the inner query returns 05-Jun-1997, 10-Dec-2002, and 2-Jan-2004, then the outer query could return 10-Sep-2002.

7. The goal of the following query is to display the minimum salary for each department whose minimum salary is less than the lowest salary of the employees in department 50. However, the subquery does not execute because it has five errors. Find them, correct them, and run the query.

```
SELECT department_id
FROM employees
WHERE MIN(salary)
HAVING MIN(salary) >
GROUP BY department_id
SELECT MIN(salary)
WHERE department_id < 50;
```

ANS:

Errors

1. MIN(salary) is missing in SELECT clause
2. WHERE MIN(salary) is not needed since HAVING MIN(salary) is already present. WHERE MIN(salary) itself would also be incorrect because the WHERE clause does not work with group functions since it only works with individual rows rather than multiple rows.
3. The operator for HAVING MIN(salary) should be "<" since the question ask for minimum salary that is less than the lowest salary of the employees in department 50.
4. GROUP BY department_id should be placed after the FROM clause and before the HAVING clause
5. The inner query has 2 errors
   a. Missing the FROM employees
   b. The WHERE clause's condition should be department_id = 50, not < 50

Corrected:
SELECT department_id, MIN(salary)
FROM employees
GROUP BY department_id
HAVING MIN(salary) < (
    SELECT MIN(salary)
    FROM employees
    WHERE department_id = 50
)

8. Which statements are true about the subquery below?
   a. The inner query could be eliminated simply by changing the WHERE clause to WHERE MIN(salary).
   b. The query wants the names of employees who make the same salary as the smallest salary in any department.
   c. The query first selects the employee ID and last name, and then compares that to the salaries in every department.
   d. This query will not execute.

   SELECT employee_id, last_name
   FROM employees
   WHERE salary = (
       SELECT MIN(salary)
       FROM employees
       GROUP BY department_id

);

9. Write a pair-wise subquery listing the last_name, first_name, department_id, and manager_id for all employees that have the same department_ id and manager_id as employee 141. Exclude employee 141 from the result set.

ANS:
SELECT last_name, first_name, department_id, manager_id
FROM employees
WHERE (department_id, manager_id) IN (
   SELECT department_id, manager_id
   FROM employees
   WHERE employee_id = 141
)

LAST_NAME	FIRST_NAME	DEPARTMENT_ID	MANAGER_ID
Rajs	Trenna	50	124
Davies	Curtis	50	124
Matos	Randall	50	124
Vargas	Peter	50	124
Bell	George	50	124
Heiden	Tiffany	50	124

6 rows returned in 0.01 seconds   Download

10. Write a non-pair-wise subquery listing the last_name, first_name, department_id, and manager_id for all employees that have the same department_ id and manager_id as employee 141.

ANS:
SELECT last_name, first_name, department_id, manager_id
FROM employees
WHERE department_id IN (
   SELECT department_id
   FROM employees
   WHERE employee_id = 141
)

```
AND manager_id IN (
   SELECT manager_id
   FROM employees
   WHERE employee_id = 141
)
```

LAST_NAME	FIRST_NAME	DEPARTMENT_ID	MANAGER_ID
Rajs	Trenna	50	124
Davies	Curtis	50	124
Matos	Randall	50	124
Vargas	Peter	50	124
Bell	George	50	124
Heiden	Tiffany	50	124

6 rows returned in 0.01 seconds   Download

10.4 - Correlated Subqueries
1. Explain the main difference between correlated and non-correlated subqueries.
    a. **ANS:** Correlated subqueries are executed for EACH row of the outer query, in which the current row is compared against those subqueries' return value. Non-correlated subqueries are executed just one time and then the outer query is compared against their return value.

2. Write a query that lists the highest earners for each department. Include the last_name, department_id, and the salary for each employee.

ANS:
```
SELECT e1.last_name, e1.department_id, e1.salary
FROM employees e1
WHERE e1.salary IN (
   SELECT MAX(e2.salary)
   FROM employees e2
   WHERE e2.department_id = e1.department_id
)
ORDER BY department_id
```

LAST_NAME	DEPARTMENT_ID	SALARY
Whalen	10	4400
Saikawa	10	4400
Hartstein	20	13000
Mourgos	50	5800
Hunold	60	9000
Abel	80	11000
Barbosa Souza	85	9500
King	90	24000
Higgins	110	12000

9 rows returned in 0.01 seconds   Download

3. Examine the following select statement and finish it so that it will return the last_name, department_id, and salary of employees who have at least one person reporting to them. We are effectively looking for managers only. In the partially written SELECT statement, the WHERE clause will work as it is, simply testing for the existence of a row in the subquery.

SELECT (enter columns here)
FROM (enter table name here) outer
WHERE 'x' IN (SELECT 'x'
        FROM (enter table name here) inner
        WHERE inner(enter column name here) = inner(enter column name here))

Finish off the statement by sorting the rows on the department_id column

ANS:
SELECT outer.last_name, outer.department_id, outer.salary
FROM employees outer
WHERE outer.employee_id IN (
    SELECT DISTINCT inner.manager_id
    FROM employees inner
    WHERE inner.manager_id = outer.employee_id
)
ORDER BY department_id;

LAST_NAME	DEPARTMENT_ID	SALARY
Hartstein	20	13000
Mourgos	50	5800
Hunold	60	9000
Zlotkey	80	10500
Kochhar	90	17000
King	90	24000
De Haan	90	17000
Higgins	110	12000

8 rows returned in 0.01 seconds   Download

4. Using a WITH clause, write a SELECT statement to list the job_title of those jobs whose maximum salary is more than half the maximum salary of the entire company. Name your subquery MAX_CALC_SAL. Name the columns in the result JOB_TITLE and JOB_TOTAL, and sort the result on JOB_TOTAL in descending order.

Hint: Examine the jobs table. You will need to join JOBS and EMPLOYEES to display the job_title.

ANS:
WITH MAX_CALC_SAL AS (
    SELECT MAX(max_salary) / 2
    FROM jobs
)

SELECT DISTINCT j.job_title job_title, j.max_salary job_total
FROM jobs j
INNER JOIN employees e
    ON j.job_id = e.job_id
WHERE j.max_salary > (SELECT * FROM MAX_CALC_SAL)

JOB_TITLE	JOB_TOTAL
Administration Vice President	30000
President	40000

2 rows returned in 0.01 seconds   Download