

# Database Programming with SQL

## 10-1: Fundamentals of Subqueries

1. What is the purpose of using a subquery?
  - A subquery is used to provide a more specific result that can be utilized by the main (outer) query. It can perform tasks such as filtering, aggregating, or limiting data, allowing for more flexible and efficient queries. Subqueries are often used to isolate values for conditions, join on intermediate data, or simplify complex queries.
2. What is a subquery?
  - A subquery, also known as an inner query or nested query, is a query within another SQL query. It is placed inside parentheses within the main query and can return single values, multiple values, or even a complete set of rows that the outer query uses for further operations.
3. What DJs on Demand d\_play\_list\_items song\_id's have the same event\_id as song\_id 45?

```
1 SELECT song_id
2 FROM d_play_list_items
3 WHERE event_id = (SELECT event_id FROM d_play_list_items WHERE song_id = 45);
```

SONG_ID
45
46
47

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

```
1 SELECT id, cost
2 FROM d_events
3 WHERE cost > (SELECT cost FROM d_events WHERE id = 100);
4
```

ID	COST
105	10000

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

```
1 SELECT track
2 FROM d_track_listings
3 WHERE cd_number = (SELECT cd_number FROM d_cds WHERE title = 'Party Music for All Occasions');
```

Results	Explain	Describe	Saved SQL	History
TRACK				
2				
3				

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

```
1 SELECT id, theme_code
2 FROM d_events
3 WHERE theme_code = (SELECT theme_code FROM d_themes WHERE description = 'Tropical');
```

Results	Explain	Describe	Saved SQL	History
ID	THEME_CODE			
100	200			
105	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?

```
1 SELECT first_name, last_name
2 FROM f_staffs
3 WHERE salary > (SELECT salary FROM f_staffs WHERE id = 12);
```

Results	Explain	Describe	Saved SQL	History
FIRST_NAME	LAST_NAME			
Bob	Miller			
Monique	Tuttle			

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

```
1 SELECT first_name, last_name
2 FROM f_staffs
3 WHERE staff_type != (SELECT staff_type FROM f_staffs WHERE first_name = 'Bob' AND last_name = 'Miller');
```

Results	Explain	Describe	Saved SQL	History
FIRST_NAME	LAST_NAME			
Sue	Doe			
Monique	Tuttle			

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

```
1 SELECT first_name, last_name
2 FROM employees
3 WHERE department_id = (SELECT department_id FROM departments WHERE department_name = 'IT');
```

Results	Explain	Describe	Saved SQL	History
FIRST_NAME		LAST_NAME		
Alexander		Hunold		
Bruce		Ernst		
Diana		Lorentz		
Chen		Li		
Alain		Fontaine		

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

```
1 SELECT department_name
2 FROM departments
3 WHERE location_id = (SELECT location_id FROM locations WHERE city = 'Seattle');
```

Results	Explain	Describe	Saved SQL	History
DEPARTMENT_NAME				
Administration				
Executive				
Accounting				
Contracting				

11. Indicate whether the statement regarding subqueries is True or False.

- It is good programming practice to place a subquery on the right side of the comparison operator.
  - True
- A subquery can reference a table that is not included in the outer query's FROM clause.
  - False
- Single-row subqueries can return multiple values to the outer query.
  - 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.

```
1 SELECT first_name, last_name, salary, department_id
2 FROM employees
3 WHERE salary > (SELECT salary FROM employees WHERE last_name = 'Lorentz')
4 AND department_id = (SELECT department_id FROM employees WHERE last_name = 'Abel');
```

FIRST_NAME	LAST_NAME	SALARY	DEPARTMENT_ID
Eleni	Zlotkey	10500	80
Ellen	Abel	11000	80
Jonathon	Taylor	8600	80
Nick	Hooper	9600	80

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

```
1 SELECT first_name, last_name, job_id, hire_date
2 FROM employees
3 WHERE job_id = (SELECT job_id FROM employees WHERE last_name = 'Rajs')
4 AND hire_date > (SELECT hire_date FROM employees WHERE last_name = 'Davies');
```

FIRST_NAME	LAST_NAME	JOB_ID	HIRE_DATE
Randall	Matos	ST_CLERK	15-Mar-2013
Peter	Vargas	ST_CLERK	09-Jul-2013
Tiffany	Heiden	ST_CLERK	06-Jul-2015

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

```
1 SELECT id, theme_code
2 FROM d_events
3 WHERE theme_code = (SELECT theme_code FROM d_events WHERE id = 100);
```

ID	THEME_CODE
100	200
105	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?

```
1 SELECT DISTINCT staff_type
2 FROM f_staffs
3 WHERE salary < (SELECT MIN(salary) FROM f_staffs WHERE staff_type = 'Cook');
```

**Results** Explain Describe Saved SQL History

STAFF_TYPE
Order Taker

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

[illegible]

- 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.

```
1 SELECT department_id, MIN(salary) AS min_salary
2 FROM employees
3 GROUP BY department_id
4 HAVING MIN(salary) > (SELECT MIN(salary) FROM employees WHERE department_id != 50);
```

DEPARTMENT_ID	MIN_SALARY
110	5200
85	7300
90	17000
10	4100
-	7000
60	4200
80	8600

## 10-3: Multiple Row Subqueries

1. What will be returned by a query if it has a subquery that returns a null?
  - If a subquery returns NULL and is used in a condition, the condition will generally return NULL (or unknown), leading to no rows being returned unless handled specifically. For example, if the outer query uses a comparison like WHERE salary > (SELECT AVG(salary) FROM employees WHERE department\_id = 999), and the subquery yields NULL, the comparison will fail, and no rows will be returned.
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.

```
1 SELECT s.id, s.title, s.duration, s.artist
2 FROM d_songs s
3 WHERE s.type_code IN (
4     SELECT type_code FROM d_types WHERE description IN ('Jazz', 'Pop')
5 );
```

Results	Explain	Describe	Saved SQL	History
ID	TITLE	DURATION	ARTIST	
45	Its Finally Over	5 min	The Hobbits	
46	Im Going to Miss My Teacher	2 min	Jane Pop	
47	Hurrah for Today	3 min	The Jubilant Trio	
48	Meet Me At the Altar	6 min	Bobby West	
49	Lets Celebrate	8 min	The Celebrants	
50	All These Years	10 min	Diana Crooner	

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

```
1 SELECT last_name
2 FROM employees
3 WHERE salary IN (SELECT MIN(salary) FROM employees GROUP BY department_id);
```

Results	Explain	Describe	Saved SQL	History
LAST_NAME				
Kochhar				
De Haan				
Taylor				
Grant				
Vargas				
Lorentz				
Alves Rocha				
Almeida Castro				
Steiner				
Stokes				

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

```
1 SELECT first_name, last_name, salary
2 FROM f_staffs
3 WHERE salary = (SELECT MIN(salary) FROM f_staffs);
```

Results	Explain	Describe	Saved SQL	History
FIRST_NAME				
LAST_NAME		SALARY		
Sue		Doe 6.75		

5. Place the correct multiple-row comparison operators in the outer query WHERE clause of each of the following:
- Which CDs in our d\_cds collection were produced before “Carpe Diem” was produced? WHERE year **<** (SELECT year ...
  - Which employees have salaries lower than any one of the programmers in the IT department? WHERE salary **< ANY** (SELECT salary ...
  - What CD titles were produced in the same year as “Party Music for All Occasions” or “Carpe Diem”? WHERE year **IN** (SELECT year ...
  - What song title has a duration longer than every type code 77 title? WHERE duration **> ALL** (SELECT duration ...

### 10-3: Multiple Row Subqueries

1. Explain the main difference between correlated and non-correlated subqueries?

- **Correlated Subqueries:**

- A correlated subquery is executed once for each row processed by the outer query.
- It references columns from the outer query, making it dependent on that outer query.

- **Non-Correlated Subqueries:**

- A non-correlated subquery is executed once and returns a result set that is independent of the outer query.
- It does not reference any columns from the outer query.

2. Write a query that lists the highest earners for each department. Include the last\_name, department\_id, and the salary for each employee.

```
1 SELECT last_name, department_id, salary
2 FROM employees e1
3 WHERE salary = (
4     SELECT MAX(salary)
5     FROM employees e2
6     WHERE e1.department_id = e2.department_id
7 );
```

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

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. So we are effectively looking for managers only. In the partially written SELECT statement, the WHERE clause will work as it is. 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.

```
1 SELECT outer.last_name, outer.department_id, outer.salary
2 FROM employees outer
3 WHERE 'x' IN (
4     SELECT 'x'
5     FROM employees inner
6     WHERE inner.manager_id = outer.employee_id
7 )
8 ORDER BY outer.department_id;
```

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



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.

```
1 WITH MAX_CALC_SAL AS (  
2     SELECT j.job_id, MAX(e.salary) AS max_salary  
3     FROM jobs j JOIN employees e ON j.job_id = e.job_id GROUP BY j.job_id)  
4 SELECT j.job_title AS JOB_TITLE, m.max_salary AS JOB_TOTAL  
5 FROM MAX_CALC_SAL m  
6 JOIN jobs j ON m.job_id = j.job_id  
7 WHERE m.max_salary > (SELECT MAX(salary) / 2 FROM employees)  
8 ORDER BY JOB_TOTAL DESC;
```

Results Explain Describe Saved SQL History

JOB_TITLE	JOB_TOTAL
President	24000
Administration Vice President	17000
Marketing Manager	13000