데이터베이스 개론

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1.

A.

```
select employee_id, first_name, salary, department_name
from employees e, departments d
where e.department_id = d.department_id and d.department_name = 'Marketing' and e.salary >=10000;
```

B.

```
select job_title, start_date
from employees e, jobs j, job_history h
where e.last_name = 'Taylor' and e.employee_id = h.employee_id and j.job_id = h.job_id
order by start_date;
```

C.

```
select department_name, first_name
from departments d, employees e
where d.manager_id = e.employee_id;
```

D.

```
select last_name, department_name, city, country_name, region_name
from locations l, employees e, departments d, countries c, regions r
where l.location_id = d.location_id and d.department_id = e.department_id and c.country_id = l.country_id and r.region_id = c.region_id and r.region_name = 'Europe' and e.salary >= 10000;
```

E.

1) use join

```
select e.first_name, e.salary, m.first_name, m.salary
from employees e, employees m
where e.manager_id = m.employee_id and e.salary >= m.salary;
```

2) use subquery

```
select e.first_name, e.salary, m.first_name, m.salary
from employees e, (select employee_id, salary, first_name
                   from employees
                   where employee_id in (select manager_id
                                         from employees)) m
```

where e.manager_id = m.employee_id and e.salary >= m.salary;

F.

```
select e.first_name, e.employee_id, m.first_name, m.employee_id
from employees e, employees m
where e.manager_id = m.employee_id and e.department_id != m.department_id;
```

G.

(1)

```
select last_name, first_name, salary, department_id
from employees e1 natural join (select e2.department_id, avg(e2.salary) AS avg_salary
                                from employees e2
                                group by department_id) e3
where e3.avg_salary < e1.salary;
```

```
SQL> select last_name, first_name, salary, department_id
  2  from employees e1 natural join (select e2.department_id, avg(e2.salary) AS avg_salary
  3                                  from employees e2
  4                                  group by department_id) e3
  5  where e3.avg_salary < e1.salary;
```

- result

```
LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
King                                      Steven                                     24000            90
Hunold                                    Alexander                                   9000            60
Ernst                                     Bruce                                       6000            60
Greenberg                                 Nancy                                      12008           100
Faviet                                    Daniel                                      9000           100
Raphaely                                  Den                                        11000            30
Weiss                                     Matthew                                     8000            50
Fripp                                     Adam                                        8200            50
Kaufling                                  Payam                                       7900            50
Vollman                                   Shanta                                      6500            50
Mourgos                                   Kevin                                       5800            50

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Ladwig                                    Renske                                      3600            50
Rajs                                      Trenna                                      3500            50
Russell                                   John                                       14000            80
Partners                                  Karen                                      13500            80
Errazuriz                                 Alberto                                    12000            80
Cambrault                                 Gerald                                     11000            80
Zlotkey                                   Eleni                                      10500            80
Tucker                                    Peter                                      10000            80
Bernstein                                 David                                       9500            80
Hall                                      Peter                                       9000            80
King                                      Janette                                    10000            80

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Sully                                     Patrick                                     9500            80
McEwen                                    Allan                                       9000            80
Vishney                                   Clara                                      10500            80
Greene                                    Danielle                                    9500            80
Ozer                                      Lisa                                       11500            80
Bloom                                     Harrison                                   10000            80
Fox                                       Tayler                                      9600            80
Abel                                      Ellen                                      11000            80
Sarchand                                  Nandita                                     4200            50
Bull                                      Alexis                                      4100            50
Chung                                     Kelly                                       3800            50

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Dilly                                     Jennifer                                    3600            50
Bell                                      Sarah                                       4000            50
Everett                                   Britney                                     3900            50
Hartstein                                 Michael                                    13000            20
Higgins                                   Shelley                                    12008           110

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```

(2)

```
select last_name, first_name, salary, department_id
from employees e1
where e1.salary > (select avg(e2.salary)
                   from employees e2
                   where e1.department_id = e2.department_id);
```

```
SQL> select last_name, first_name, salary, department_id
  2  from employees e1
  3  where e1.salary > (select avg(e2.salary)
  4                     from employees e2
  5                     where e1.department_id = e2.department_id);
```

- result

```
LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
King                                      Steven                                     24000            90
Hunold                                    Alexander                                   9000            60
Ernst                                     Bruce                                       6000            60
Greenberg                                 Nancy                                      12008           100
Faviet                                    Daniel                                      9000           100
Raphaely                                  Den                                        11000            30
Weiss                                     Matthew                                     8000            50
Fripp                                     Adam                                        8200            50
Kaufling                                  Payam                                       7900            50
Vollman                                   Shanta                                      6500            50
Mourgos                                   Kevin                                       5800            50

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Ladwig                                    Renske                                      3600            50
Rajs                                      Trenna                                      3500            50
Russell                                   John                                       14000            80
Partners                                  Karen                                      13500            80
Errazuriz                                 Alberto                                    12000            80
Cambrault                                 Gerald                                     11000            80
Zlotkey                                   Eleni                                      10500            80
Tucker                                    Peter                                      10000            80
Bernstein                                 David                                       9500            80
Hall                                      Peter                                       9000            80
King                                      Janette                                    10000            80

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Sully                                     Patrick                                     9500            80
McEwen                                    Allan                                       9000            80
Vishney                                   Clara                                      10500            80
Greene                                    Danielle                                    9500            80
Ozer                                      Lisa                                       11500            80
Bloom                                     Harrison                                   10000            80
Fox                                       Tayler                                      9600            80
Abel                                      Ellen                                      11000            80
Sarchand                                  Nandita                                     4200            50
Bull                                      Alexis                                      4100            50
Chung                                     Kelly                                       3800            50

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Dilly                                     Jennifer                                    3600            50
Bell                                      Sarah                                       4000            50
Everett                                   Britney                                     3900            50
Hartstein                                 Michael                                    13000            20
Higgins                                   Shelley                                    12008           110

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```

(3)

```
select last_name, first_name, salary, department_id
```

```
from (select last_name, first_name, salary, department_id,
        avg(salary) over(partition by department_id) as avg_sal
        from employees) e
where e.avg_sal < e.salary;
```

```
SQL> select last_name, first_name, salary, department_id
  2  from (select last_name, first_name, salary, department_id,
  3        avg(salary) over(partition by department_id) as avg_sal
  4        from employees) e
  5  where e.avg_sal < e.salary;
```

- result

```
LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Hartstein                                 Michael                                    13000            20
Raphaely                                  Den                                        11000            30
Weiss                                     Matthew                                     8000            50
Fripp                                     Adam                                        8200            50
Kaufling                                  Payam                                       7900            50
Vollman                                   Shanta                                      6500            50
Mourgos                                   Kevin                                       5800            50
Ladwig                                    Renske                                      3600            50
Rajs                                      Trenna                                      3500            50
Sarchand                                  Nandita                                     4200            50
Bull                                      Alexis                                      4100            50

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Chung                                     Kelly                                       3800            50
Dilly                                     Jennifer                                    3600            50
Bell                                      Sarah                                       4000            50
Everett                                   Britney                                     3900            50
Hunold                                    Alexander                                   9000            60
Ernst                                     Bruce                                       6000            60
Russell                                   John                                       14000            80
Partners                                  Karen                                      13500            80
Errazuriz                                 Alberto                                    12000            80
Cambrault                                 Gerald                                     11000            80
Zlotkey                                   Eleni                                      10500            80

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Tucker                                    Peter                                      10000            80
Bernstein                                 David                                       9500            80
Hall                                      Peter                                       9000            80
King                                      Janette                                    10000            80
Sully                                     Patrick                                     9500            80
McEwen                                    Allan                                       9000            80
Vishney                                   Clara                                      10500            80
Greene                                    Danielle                                    9500            80
Ozer                                      Lisa                                       11500            80
Bloom                                     Harrison                                   10000            80
Fox                                       Tayler                                      9600            80

LAST_NAME                                 FIRST_NAME                                SALARY DEPARTMENT_ID
----------------------------------------- ----------------------------------------- ---------- -------------
Abel                                      Ellen                                      11000            80
King                                      Steven                                     24000            90
Greenberg                                 Nancy                                      12008           100
Faviet                                    Daniel                                      9000           100
Higgins                                   Shelley                                    12008           110

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```

H.

```
select department_name, salary as payroll
from (select d.department_name, sum(e.salary) as salary, rank() over(order by sum(e.salary) asc) as rank
      from departments d, employees e
      where d.department_id = e.department_id
      group by d.department_name)
```

where rank <= 1;

```
SQL> select department_name, salary as payroll
  2  from (select d.department_name, sum(e.salary) as salary, rank() over(order by sum(e.salary) asc) as rank
  3        from departments d, employees e
  4        where d.department_id = e.department_id
  5        group by d.department_name)
  6  where rank <= 1;

DEPARTMENT_NAME                                            PAYROLL
---------------------------------------------------------- ----------
Administration                                               4400
```

I.

```
select department_name, salary_average
from (select d.department_name, avg(e.salary) as salary_average
        from employees e, departments d
        where e.department_id = d.department_id
        group by d.department_name)
where salary_average > (select avg(e.salary)
                        from employees e, departments d
                        where e.department_id = d.department_id and
d.department_name = 'IT');
```

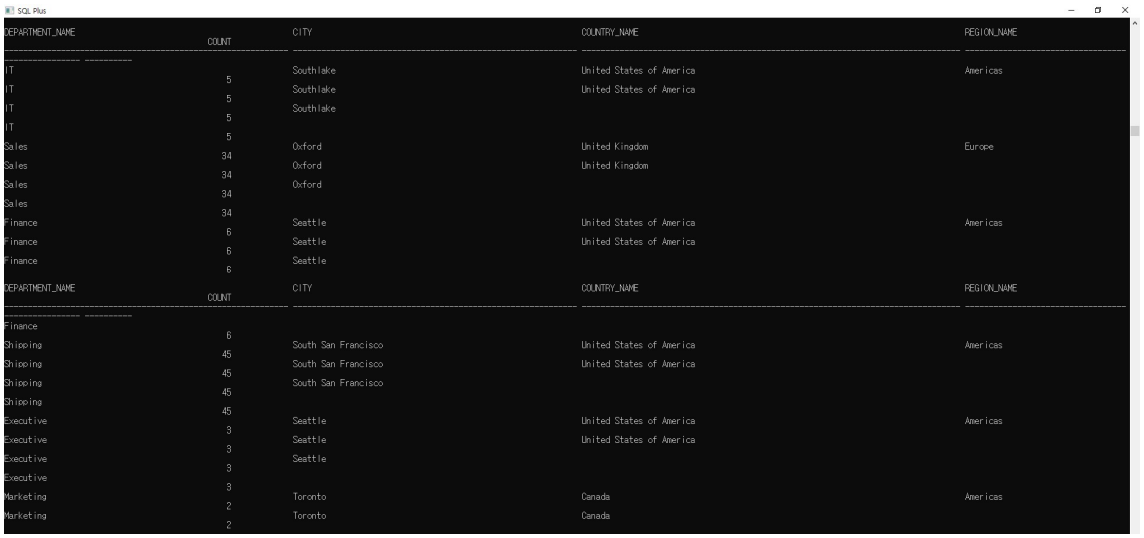
```
SQL> select department_name, salary_average
  2  from (select d.department_name, avg(e.salary) as salary_average
  3        from employees e, departments d
  4        where e.department_id = d.department_id
  5        group by d.department_name)
  6  where salary_average > (select avg(e.salary)
  7                          from employees e, departments d
  8                          where e.department_id = d.department_id and d.department_name = 'IT');

DEPARTMENT_NAME                                            SALARY_AVERAGE
---------------------------------------------------------- --------------
Sales                                                         8955.88235
Marketing                                                           9500
Executive                                                     19333.3333
Finance                                                       8601.33333
Public Relations                                                   10000
Human Resources                                                     6500
Accounting                                                         10154
```

J.

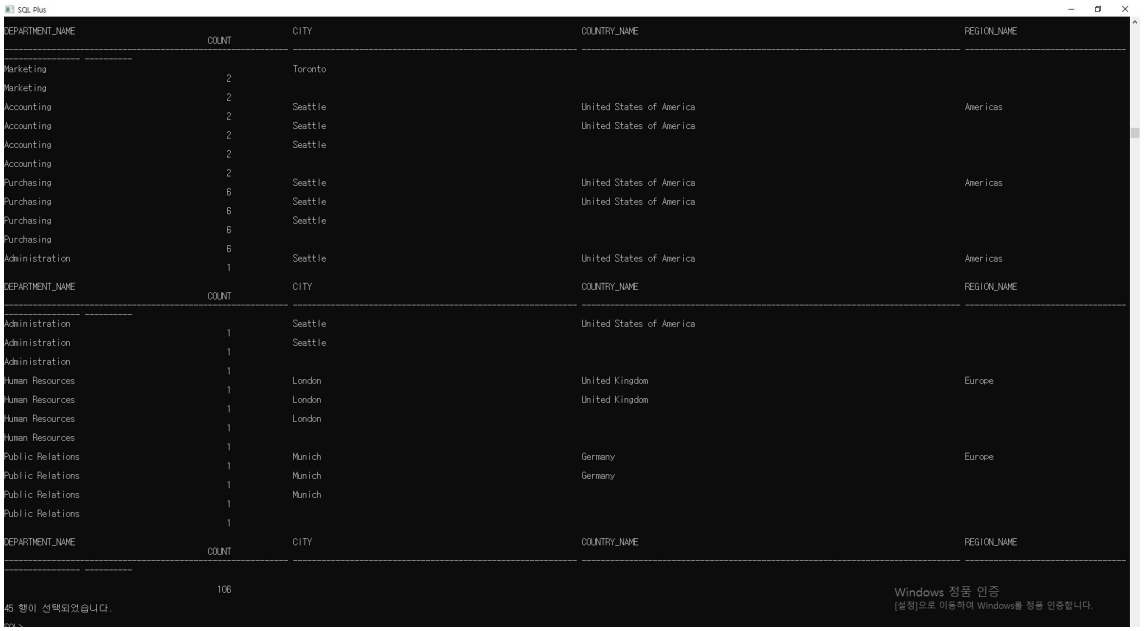
```
select d.department_name, l.city, c.country_name, r.region_name, count(*) as count
from employees e, departments d, locations l, countries c, regions r
where l.location_id = d.location_id and d.department_id = e.department_id and
c.country_id = l.country_id and r.region_id = c.region_id
group by rollup(d.department_name, l.city, c.country_name, r.region_name);
```

```
SQL> select d.department_name, l.city, c.country_name, r.region_name, count(*) as count
  2  from employees e, departments d, locations l, countries c, regions r
  3  where l.location_id = d.location_id and d.department_id = e.department_id and c.country_id = l.country_id and r.region_id = c.region_id
  4  group by rollup(d.department_name, l.city, c.country_name, r.region_name);
```

-result



DEPARTMENT_NAME	COUNT	CITY	COUNTRY_NAME	REGION_NAME
IT	5	Southlake	United States of America	Americas
IT	5	Southlake	United States of America	
IT	5	Southlake		
IT	5			
Sales	34	Oxford	United Kingdom	Europe
Sales	34	Oxford	United Kingdom	
Sales	34	Oxford		
Sales	34			
Finance	6	Seattle	United States of America	Americas
Finance	6	Seattle	United States of America	
Finance	6	Seattle		
Finance	6			
Shipping	45	South San Francisco	United States of America	Americas
Shipping	45	South San Francisco	United States of America	
Shipping	45	South San Francisco		
Shipping	45			
Executive	3	Seattle	United States of America	Americas
Executive	3	Seattle	United States of America	
Executive	3	Seattle		
Executive	3			
Marketing	2	Toronto	Canada	Americas
Marketing	2	Toronto	Canada	



DEPARTMENT_NAME	COUNT	CITY	COUNTRY_NAME	REGION_NAME
Marketing	2	Toronto		
Marketing	2			
Accounting	2	Seattle	United States of America	Americas
Accounting	2	Seattle	United States of America	
Accounting	2	Seattle		
Accounting	2			
Purchasing	6	Seattle	United States of America	Americas
Purchasing	6	Seattle	United States of America	
Purchasing	6	Seattle		
Purchasing	6			
Administration	1	Seattle	United States of America	Americas
Administration	1	Seattle	United States of America	
Administration	1	Seattle		
Administration	1			
Human Resources	1	London	United Kingdom	Europe
Human Resources	1	London	United Kingdom	
Human Resources	1	London		
Human Resources	1			
Public Relations	1	Munich	Germany	Europe
Public Relations	1	Munich	Germany	
Public Relations	1	Munich		
Public Relations	1			
	106			

45 행이 선택되었습니다.

Windows 정품 인증
[설정]으로 이동하여 Windows를 정품 인증합니다.

K.

```
select e.last_name, e.first_name
from employees e
where e.employee_id in (select h1.employee_id
                        from job_history h1
                        where not exists(select j.job_id
                                         from jobs j
                                         where j.job_id like 'SA%' and not
exists(select *
        from job_history h2
        where (h2.employee_id = h1.employee_id) and (h2.job_id = j.job_id))));
```

```
SQL> select e.last_name, e.first_name
  2  from employees e
  3  where e.employee_id in (select h1.employee_id
  4                          from job_history h1
  5                          where not exists(select j.job_id
  6                                           from jobs j
  7                                           where j.job_id like 'SA%' and not exists(select *
  8                                                                                    from job_history h2
  9                                                                                    where (h2.employee_id = h1.employee_id) and (h2.job_id = j.job_id))));

LAST_NAME                                 FIRST_NAME
----------------------------------------- ----------------------------------------
Taylor                                    Jonathon
```

2.

왼쪽의 쿼리문은 p와 r1테이블을 cross product시킨 후, p의 a1 column의 값이 r1의 a1 column과 같은 것을 selection하고, p와 r2테이블을 cross product시킨 후, p의 a1 column의 값이 r2의 a1 column이 같은 것들을 selection한 값들을 합치고 중복을 제거한 것이다.

오른쪽의 쿼리문은 p와 r1, r2테이블을 전부 cross product를 시킨 후, 그 중에서 p의 a1 column과 r1의 a1의 column이 같거나 p의 a1 column과 r2의 a1의 column이 같은 것을 selection한 것이다.

만약 a1이라는 값이 1,2,3...n의 값을 갖는다고 가정해보자. 그리고 그 값들은 p테이블에서 각각 $P_1, P_2, P_3 \ldots P_n$의 개수를 가지고, r1테이블에서 $A_1, A_2, A_3 \ldots A_n$의 개수를 가지고, r2테이블에서는 $B_1, B_2, B_3 \ldots B_n$의 개수를 가진다고 가정해보자.

그렇다면 왼쪽 쿼리문은 중복이 허용되지 않으므로 만약 1의 값이 p테이블에 있고, r1테이블에 있거나 r2테이블에 존재하면 1개의 값을 가지게 된다.

반면 오른쪽 쿼리문에서는 1의 값은

$P_1(A_1(B_1 + B_2 + \ldots + B_n) + B_1(A_1 + A_2 + \ldots + A_n) - A_1B_1)$번이 나오는데

$P_1A_1(B_1 + B_2 + \ldots + B_n)$은 p.a1 = r1.a1에서 만들어진 개수이고

$P_2B_1(A_1 + A_2 + \ldots + A_n)$은 p.a1 = r2.a1에서 만들어진 개수이다.

또한 $-P_1A_1B_1$는 위 두 값에서 겹치는 것을 빼준 경우의 수가 된다.

정리하면 왼쪽 쿼리문에서는 j의 값이 p테이블에 있고, r1테이블에 있거나 r2테이블에 존재하면 1번 등장하고, 오른쪽 쿼리문에서는 j값이 $P_j(A_j(B_1 + B_2 + \ldots + B_n) + B_j(A_1 + A_2 + \ldots + A_n) - A_jB_j)$번 등장하게 된다. 그러므로 두 쿼리문이 의미하는 바는 다르다고 할 수 있다.