Recapitulare comanda SQL SELECT . Aspecte avansate
- 3 –

Interogari combinate. Operatii pe multimi.

Tables Used in the Course

EMPLOYEES

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	SALARY	COMMISSION_PCT	DEPARTMENT_ID	EMAIL	PHONE_NUMBER	HIRE_DATE
100	Steven	King	24000	(null)	90	SKING	515.123.4567	17-JUN-87
101	Neena	Kochhar	17000	(null)	90	NKOCHHAR	515.123.4568	21-SEP-89
102	Lex	De Haan	17000	(null)	90	LDEHAAN	515.123.4569	13-JAN-93
103	Alexander	Hunold	9000	(null)	60	AHUNOLD	590.423.4567	03-JAN-90
104	Bruce	Ernst	6000	(null)	60	BERNST	590.423.4568	21-MAY-91
107	Diana	Lorentz	4200	(null)	60	DLORENTZ	590.423.5567	07-FEB-99
124	Kevin	Mourgos	5800	(null)	50	KMOURGOS	650.123.5234	16-NOV-99
141	Trenna	Rajs	3500	(null)	50	TRAJS	650.121.8009	17-OCT-95
142	Curtis	Davies	3100	(null)	50	CDAVIES	650.121.2994	29-JAN-97
143	Randall	Matos	2600	(null)	50	RMATOS	650.121.2874	15-MAR-98
144	Peter	Vargas	2500	(null)	50	PVARGAS	650.121.2004	09-JUL-98
149	Eleni	Zlotkey	10500	0.2	80	EZLOTKEY	011.44.1344.429018	29-JAN-00
174	Ellen	Abel	11000	0.3	80	EABEL	011.44.1644.429267	11-MAY-96
176	Jonathon	Taylor	8600	0.2	80	JTAYLOR	011.44.1644.429265	24-MAR-98
178	Kimberely	Grant	7000	0.15	(null)	KGRANT	011.44.1644.429263	24-MAY-99
200	Jennifer	Whalen	4400	(null)	10	JWHALEN	515.123.4444	17-SEP-87
201	Michael	Hartstein	13000	(null)	20	MHARTSTE	515.123.5555	17-FEB-96
202	Pat	Fay	6000	(null)	20	PFAY	603.123.6666	17-AUG-97
205	Shelley	Higgins	12000	(null)	110	SHIGGINS	515.123.8080	07-JUN-94
206	William	Gietz	8300	(null)	110	WGIETZ	515.123.8181	07-JUN-94

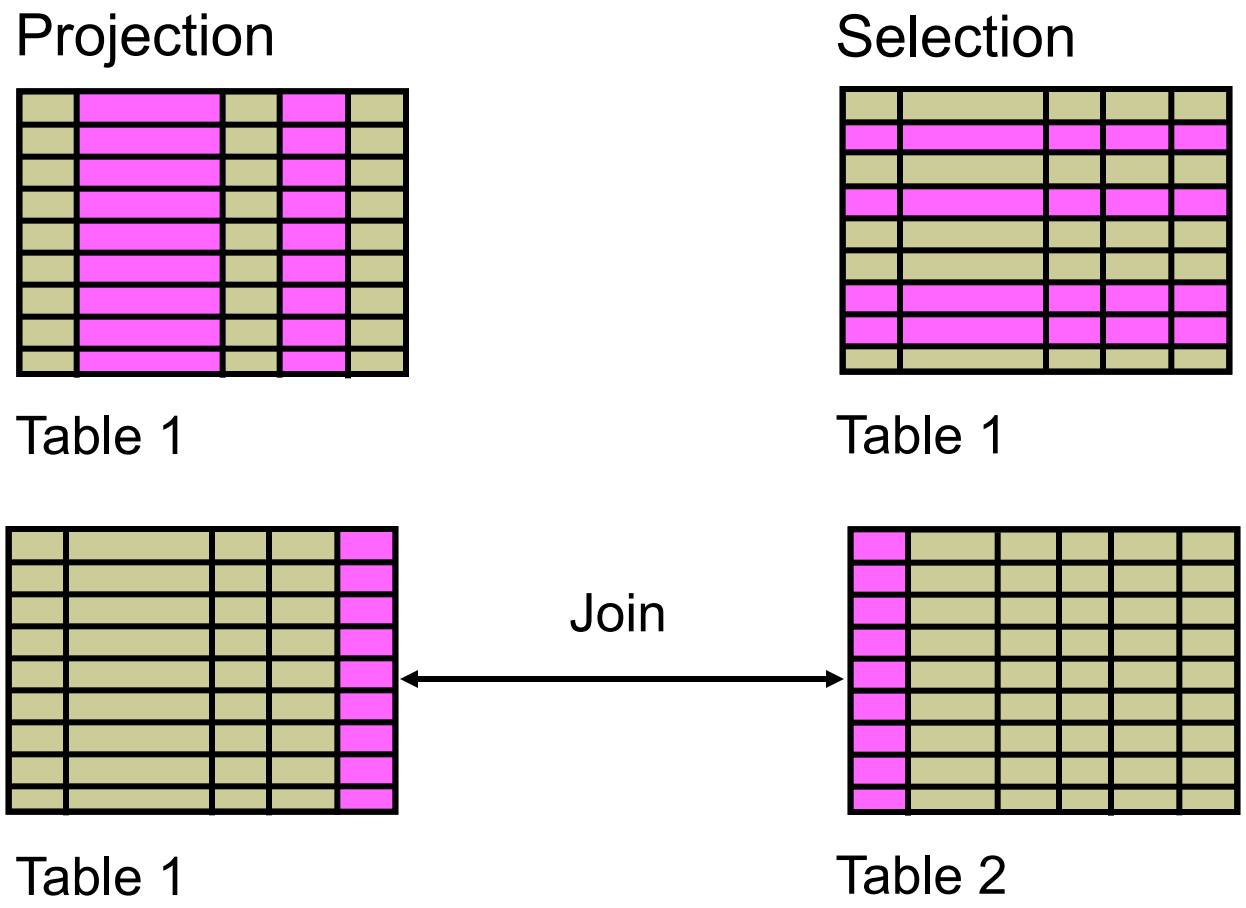
GRADE_LEVEL	LOWEST_SAL	HIGHEST_SAL
A	1000	2999
B	3000	5999
C	6000	9999
D	10000	14999
E	15000	24999
F	25000	40000

JOB_GRADES

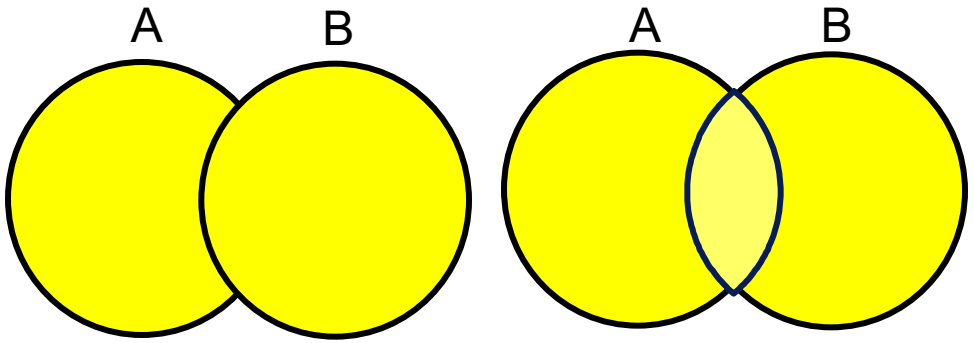
DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500
90	Executive	100	1700
110	Accounting	205	1700
190	Contracting	(null)	1700

DEPARTMENTS

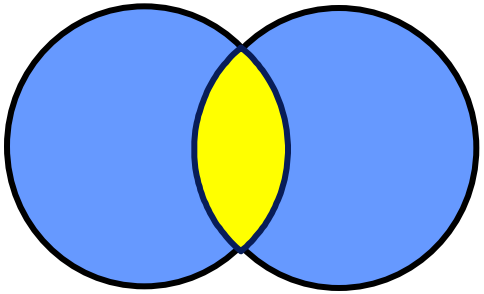
Capabilities of SQL `SELECT` Statements



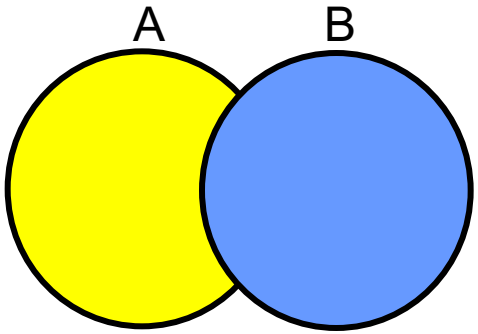
Set Operators



UNION/UNION ALL



INTERSECT



MINUS

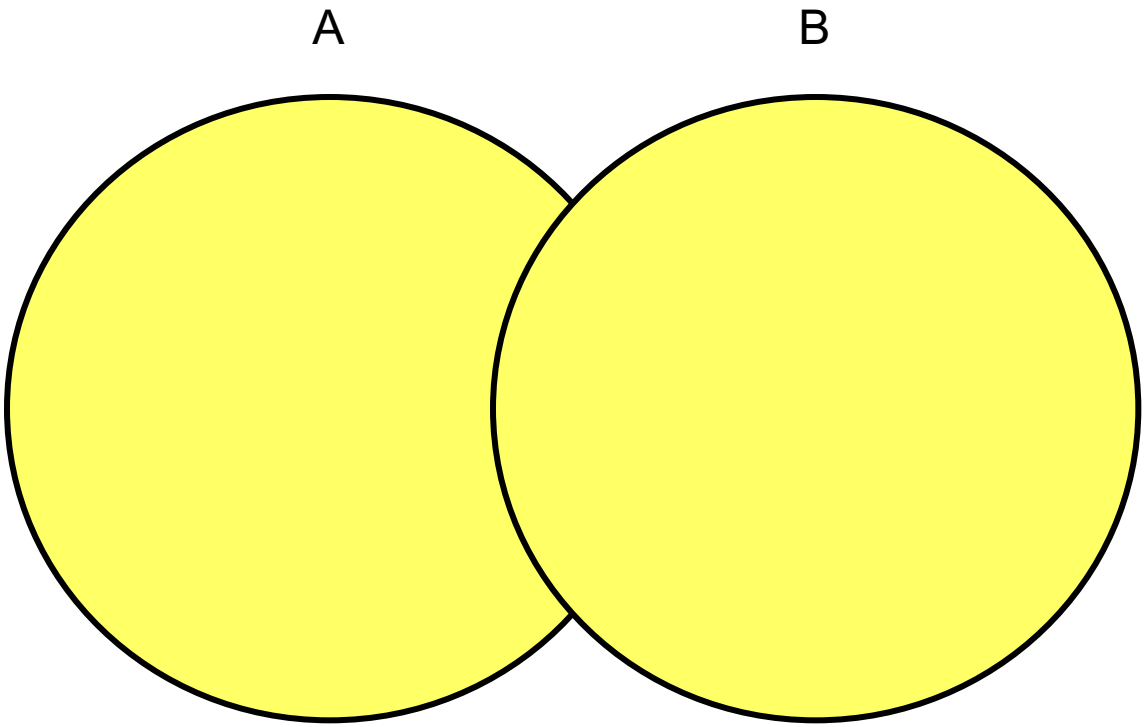
Set Operator Guidelines

- The expressions in the `SELECT` lists must match in number.
- The data type of each column in the second query must match the data type of its corresponding column in the first query.
- Parentheses can be used to alter the sequence of execution (by default, all operators have equal precedence)
- `ORDER BY` clause can appear only at the very end of the statement.

Oracle Server and Set Operators

- Duplicate rows are automatically eliminated except in `UNION ALL`.
- Column names from the first query appear in the result.
- The output is sorted in ascending order by default except in `UNION ALL`.

UNION Operator



The UNION operator returns rows from both queries after eliminating duplications.

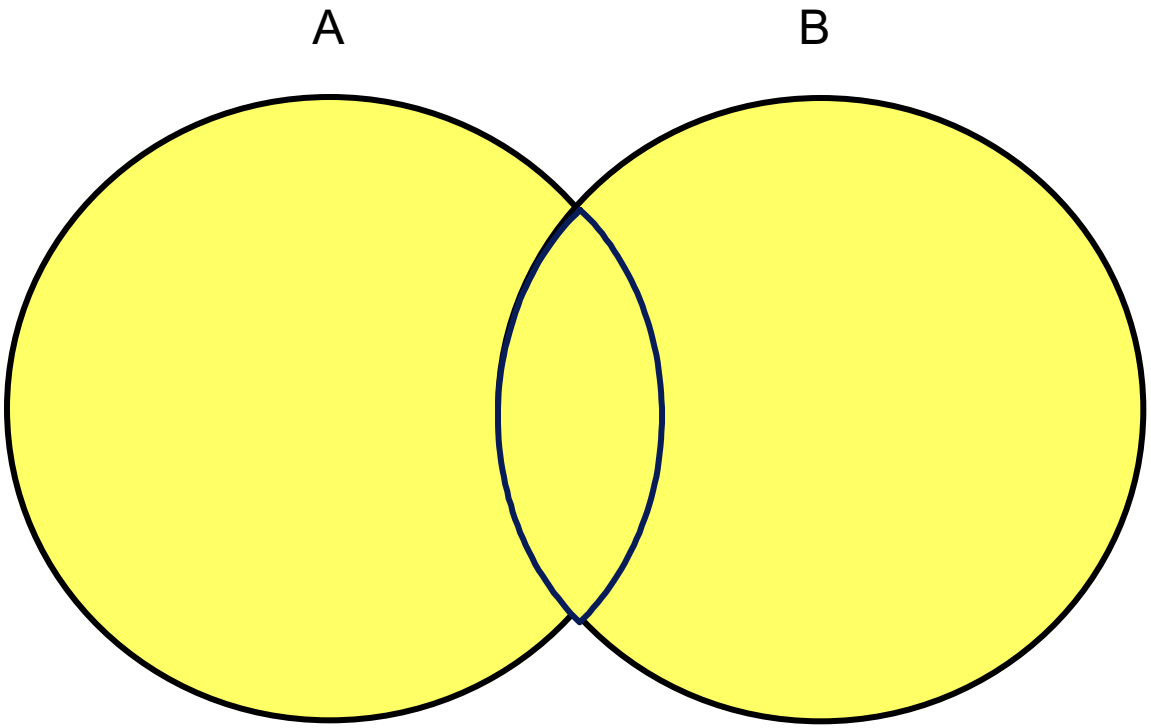
Using the UNION Operator

- *Display the current and previous job details of all employees. Display each employee only once.*

```
SELECT employee_id, job_id
FROM   employees
UNION
SELECT employee_id, job_id
FROM   job_history;
```

	EMPLOYEE_ID	JOB_ID
1	100	AD_PRES
2	101	AC_ACCOUNT
...		
22	200	AC_ACCOUNT
23	200	AD_ASST
...		
27	205	AC_MGR
28	206	AC_ACCOUNT

UNION ALL Operator



The UNION ALL operator returns rows from both queries, including all duplications.

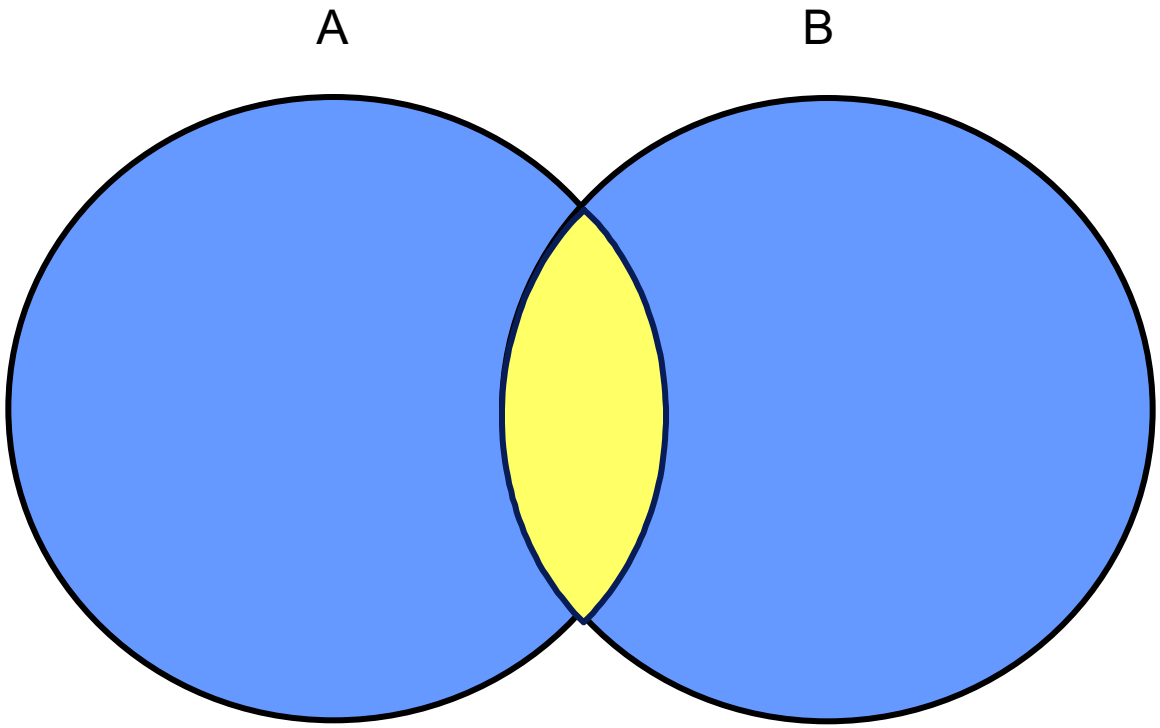
Using the UNION ALL Operator

- *Display the current and previous departments of all employees.*

```
SELECT employee_id, job_id, department_id
FROM   employees
UNION ALL
SELECT employee_id, job_id, department_id
FROM   job_history
ORDER BY  employee_id;
```

	EMPLOYEE_ID	JOB_ID	DEPARTMENT_ID
1	100	AD_PRES	90
...			
17	149	SA_MAN	80
18	174	SA_REP	80
19	176	SA_REP	80
20	176	SA_MAN	80
21	176	SA_REP	80
22	178	SA_REP	(null)
23	200	AD_ASST	10
...			
30	206	AC_ACCOUNT	110

INTERSECT Operator



The INTERSECT operator returns rows that are common to both queries.

Using the INTERSECT Operator

- *Display the employee IDs and job IDs of those employees who currently have a job title that is the same as their previous one (that is, they changed jobs but have now gone back to doing the same job they did previously).*

```
SELECT employee_id, job_id
FROM   employees
INTERSECT
SELECT employee_id, job_id
FROM   job_history;
```

	EMPLOYEE_ID	JOB_ID
1	176	SA_REP
2	200	AD_ASST

Matching the SELECT Statements

- Using the UNION operator, display the location ID, department name, and the state where it is located.
- You must match the data type (using the TO_CHAR function or any other conversion functions) when columns do not exist in one or the other table.

```
SELECT location_id, department_name "Department",
   TO_CHAR(NULL) "Warehouse location"
FROM departments
UNION
SELECT location_id, TO_CHAR(NULL) "Department",
   state_province
FROM locations;
```

Matching the SELECT Statement

- *Using the UNION operator, display the employee ID, job ID, and salary of all employees.*

```
SELECT employee_id, job_id,salary
FROM   employees
UNION
SELECT employee_id, job_id,0
FROM   job_history;
```

	EMPLOYEE_ID	JOB_ID	SALARY
1	100	AD_PRES	24000
2	101	AC_ACCOUNT	0
3	101	AC_MGR	0
4	101	AD_VP	17000
5	102	AD_VP	17000
...			
29	205	AC_MGR	12000
30	206	AC_ACCOUNT	8300

Using the ORDER BY Clause in Set Operations

- The ORDER BY clause can appear only once at the end of the compound query.
- Component queries cannot have individual ORDER BY clauses.
- The ORDER BY clause recognizes only the columns of the first SELECT query.
- By default, the first column of the first SELECT query is used to sort the output in an ascending order.

Recapitulare comanda SQL SELECT . Aspecte avansate
- 4 –

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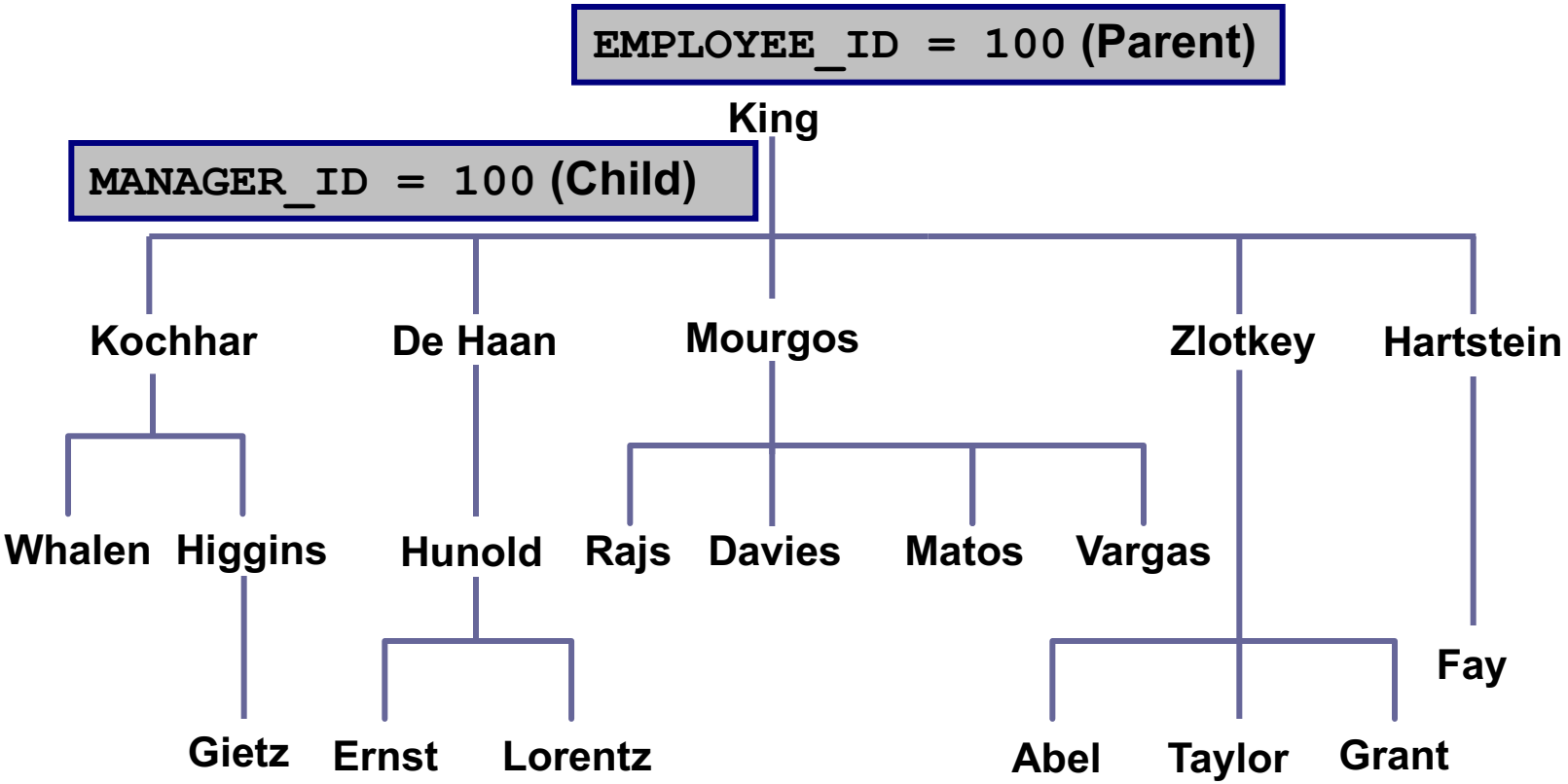
Sample Data from the EMPLOYEES Table

	EMPLOYEE_ID	LAST_NAME	JOB_ID	MANAGER_ID
1	100	King	AD_PRES	(null)
2	101	Kochhar	AD_VP	100
3	102	De Haan	AD_VP	100
4	103	Hunold	IT_PROG	102
5	104	Ernst	IT_PROG	103
6	107	Lorentz	IT_PROG	103

...

16	200	Whalen	AD_ASST	101
17	201	Hartstein	MK_MAN	100
18	202	Fay	MK_REP	201
19	205	Higgins	AC_MGR	101
20	206	Gietz	AC_ACCOUNT	205

Natural Tree Structure



Hierarchical Queries

```
SELECT [LEVEL], column, expr...
FROM   table
[WHERE condition(s)]
[START WITH condition(s)]
[CONNECT BY PRIOR condition(s)] ;
```

condition:

```
expr comparison_operator expr
```

Walking the Tree

Starting Point

- Specifies the condition that must be met
- Accepts any valid condition

```
START WITH column1 = value
```

- ***Using the EMPLOYEES table, start with the employee whose last name is Kochhar.***

```
...START WITH last_name = 'Kochhar'
```

Walking the Tree

```
CONNECT BY PRIOR column1 = column2
```

```
... CONNECT BY PRIOR employee_id = manager_id
```

Direction

Top down → Column1 = Parent Key
Column2 = Child Key

Bottom up → Column1 = Child Key
Column2 = Parent Key

Walking the Tree: From the Bottom Up

- *Walk from the bottom up, using the* `EMPLOYEES` *table.*

```
SELECT employee_id, last_name, job_id, manager_id
FROM   employees
START  WITH  employee_id = 101
CONNECT BY PRIOR manager_id = employee_id ;
```

	EMPLOYEE_ID	LAST_NAME	JOB_ID	MANAGER_ID
1	101	Kochhar	AD_VP	100
2	100	King	AD_PRES	(null)

Walking the Tree: From the Top Down

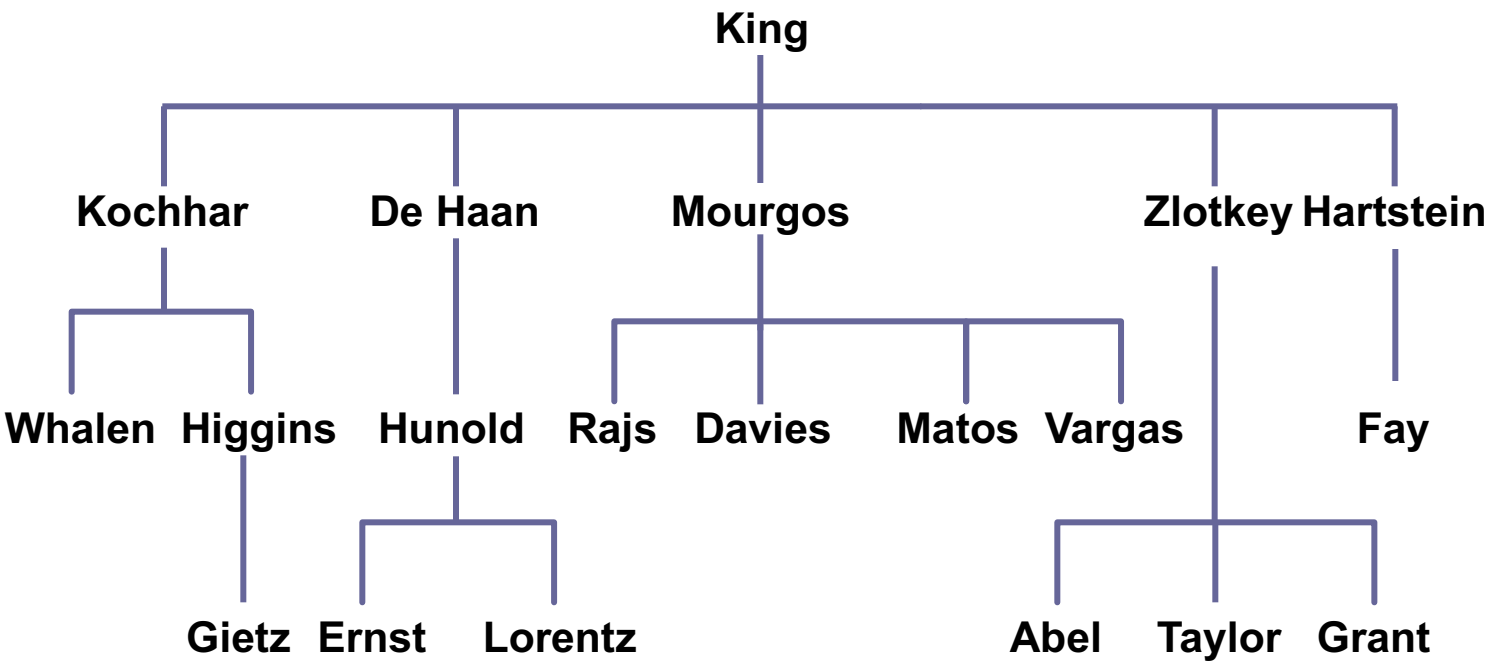
```
SELECT  last_name||' reports to '||
PRIOR   last_name "Walk Top Down"
FROM    employees
START   WITH last_name = 'King'
CONNECT BY PRIOR employee_id = manager_id ;
```

	Walk Top Down
1	King reports to
2	King reports to
3	Kochhar reports to King
4	Greenberg reports to Kochhar
5	Faviet reports to Greenberg

...

105	Grant reports to Zlotkey
106	Johnson reports to Zlotkey
107	Hartstein reports to King
108	Fay reports to Hartstein

Ranking Rows with the LEVEL Pseudocolumn



Level 1 root/ parent

Level 2 parent/ child/leaf

Level 3 parent/ child/leaf

Level 4 leaf

Formatting Hierarchical Reports by Using LEVEL and LPAD

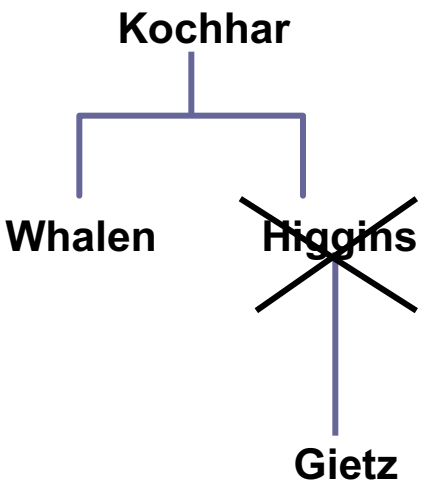
- *Create a report displaying company management levels, beginning with the highest level and indenting each of the following levels.*

```
COLUMN org_chart FORMAT A12
SELECT LPAD(last_name, LENGTH(last_name)+(LEVEL*2)-2,'_')
       AS org_chart
FROM   employees
START WITH first_name='Steven' AND last_name='King'
CONNECT BY PRIOR employee_id=manager_id
```

Pruning Branches

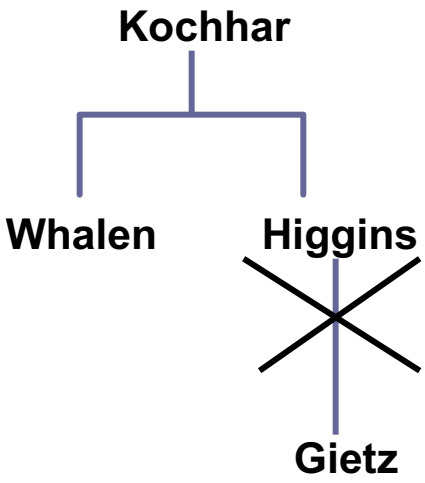
Use the `WHERE` clause to eliminate a node.

```
WHERE last_name != 'Higgins'
```



Use the `CONNECT BY` clause to eliminate a branch.

```
CONNECT BY PRIOR
employee_id = manager_id
AND last_name != 'Higgins'
```



Recapitulare comanda SQL SELECT . Aspecte avansate
- 5 –

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Reporting operations

- `ROLLUP` operation to produce subtotal values
- `CUBE` operation to produce cross-tabulation values
- `GROUPING` function to identify the row values created by `ROLLUP` or `CUBE`
- `GROUPING SETS` to produce a single result set

Group Functions: Review

- Group functions operate on sets of rows to give one result per group.

```
SELECT        [column,] group_function(column). . .
FROM          table
[WHERE        condition]
[GROUP BY     group_by_expression]
[ORDER BY     column];
```

- Example:

```
SELECT AVG(salary), STDDEV(salary),
       COUNT(commission_pct),MAX(hire_date)
FROM   employees
WHERE  job_id LIKE 'SA%';
```

GROUP BY Clause: Review

- Syntax:

```
SELECT        [column,] group_function(column). . .
FROM          table
[WHERE        condition]
[GROUP BY     group_by_expression]
[ORDER BY     column];
```

- Example:

```
SELECT    department_id, job_id, SUM(salary),
          COUNT(employee_id)
FROM      employees
GROUP BY department_id, job_id ;
```

HAVING Clause: Review

- Use the HAVING clause to specify which groups are to be displayed.
- You further restrict the groups on the basis of a limiting condition.

```
SELECT        [column,] group_function(column)...
FROM          table
[WHERE        condition]
[GROUP BY     group_by_expression]
[HAVING       having_expression]
[ORDER BY     column];
```

GROUP BY with ROLLUP and CUBE Operators

- Use ROLLUP or CUBE with GROUP BY to produce superaggregate rows by cross-referencing columns.
- ROLLUP grouping produces a result set containing the regular grouped rows and the subtotal values.
- CUBE grouping produces a result set containing the rows from ROLLUP and cross-tabulation rows.

ROLLUP Operator

- ROLLUP is an extension to the GROUP BY clause.
- Use the ROLLUP operation to produce cumulative aggregates, such as subtotals.

```
SELECT      [column,] group_function(column). . .
FROM        table
[WHERE      condition]
[GROUP BY   [ROLLUP] group_by_expression]
[HAVING     having_expression];
[ORDER BY   column];
```

ROLLUP Operator: Example

```
SELECT    department_id, job_id, SUM(salary)
FROM      employees
WHERE     department_id < 60
GROUP BY ROLLUP(department_id, job_id);
```

	DEPARTMENT_ID	JOB_ID	SUM(SALARY)
1	10	AD_ASST	4400
2	10	(null)	4400
3	20	MK_MAN	13000
4	20	MK_REP	6000
5	20	(null)	19000
6	30	PU_MAN	11000
7	30	PU_CLERK	13900
8	30	(null)	24900
9	40	HR_REP	6500
10	40	(null)	6500
11	50	ST_MAN	36400
12	50	SH_CLERK	64300
13	50	ST_CLERK	55700
14	50	(null)	156400
15	(null)	(null)	211200

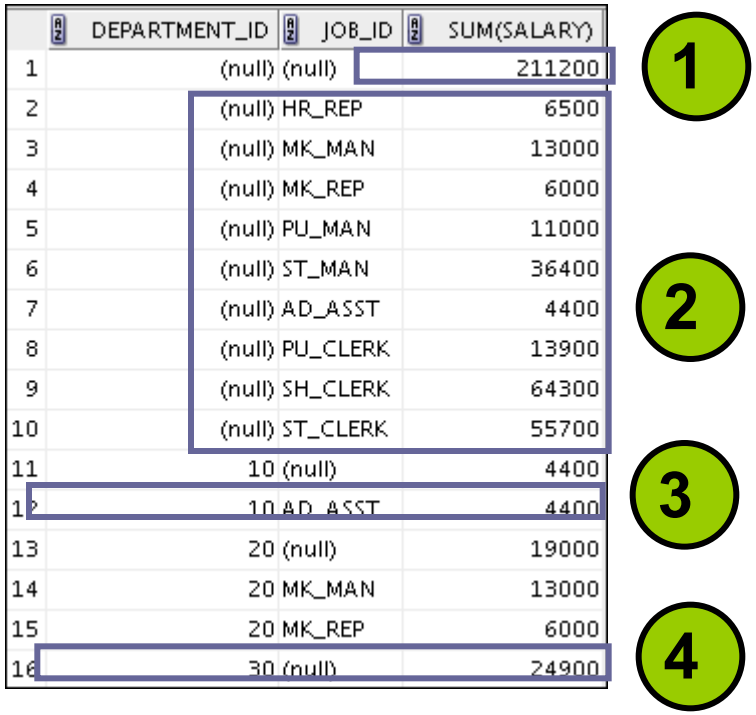
CUBE Operator

- CUBE is an extension to the GROUP BY clause.
- You can use the CUBE operator to produce cross-tabulation values with a single SELECT statement.

```
SELECT      [column,] group_function(column)...
FROM        table
[WHERE      condition]
[GROUP BY   [CUBE] group_by_expression]
[HAVING     having_expression]
[ORDER BY   column];
```

CUBE Operator: Example

```
SELECT    department_id, job_id, SUM(salary)
FROM      employees
WHERE     department_id < 60
GROUP BY CUBE (department_id, job_id) ;
```



	DEPARTMENT_ID	JOB_ID	SUM(SALARY)
1	(null)	(null)	211200
2	(null)	HR_REP	6500
3	(null)	MK_MAN	13000
4	(null)	MK_REP	6000
5	(null)	PU_MAN	11000
6	(null)	ST_MAN	36400
7	(null)	AD_ASST	4400
8	(null)	PU_CLERK	13900
9	(null)	SH_CLERK	64300
10	(null)	ST_CLERK	55700
11	10	(null)	4400
12	10	AD_ASST	4400
13	20	(null)	19000
14	20	MK_MAN	13000
15	20	MK_REP	6000
16	30	(null)	24900

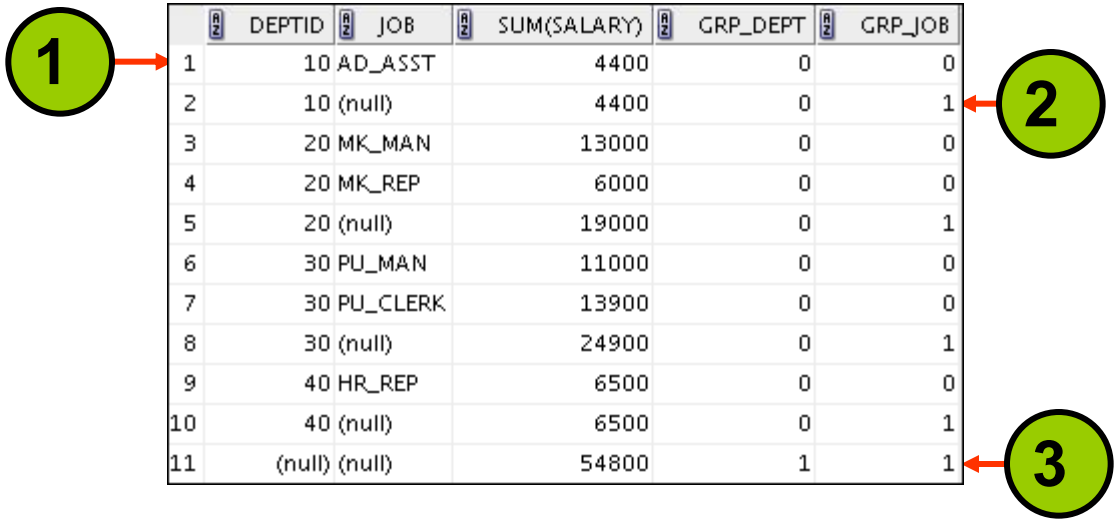
GROUPING Function

- **The GROUPING function:**
  - Is used with either the CUBE or ROLLUP operator
  - Is used to find the groups forming the subtotal in a row
  - Is used to differentiate stored NULL values from NULL values created by ROLLUP or CUBE
  - Returns 0 or 1

```
SELECT      [column,] group_function(column) .. ,
            GROUPING(expr)
FROM        table
[WHERE      condition]
[GROUP BY [ROLLUP][CUBE] group_by_expression]
[HAVING     having_expression]
[ORDER BY column];
```

GROUPING Function: Example

```
SELECT    department_id DEPTID, job_id JOB,
          SUM(salary),
          GROUPING(department_id) GRP_DEPT,
          GROUPING(job_id) GRP_JOB
FROM      employees
WHERE     department_id < 50
GROUP BY ROLLUP(department_id, job_id);
```



	DEPTID	JOB	SUM(SALARY)	GRP_DEPT	GRP_JOB
1	10	AD_ASST	4400	0	0
2	10	(null)	4400	0	1
3	20	MK_MAN	13000	0	0
4	20	MK_REP	6000	0	0
5	20	(null)	19000	0	1
6	30	PU_MAN	11000	0	0
7	30	PU_CLERK	13900	0	0
8	30	(null)	24900	0	1
9	40	HR_REP	6500	0	0
10	40	(null)	6500	0	1
11	(null)	(null)	54800	1	1

GROUPING SETS

- The `GROUPING SETS` syntax is used to define multiple groupings in the same query.
- All groupings specified in the `GROUPING SETS` clause are computed and the results of individual groupings are combined with a `UNION ALL` operation.
- Grouping set efficiency:
  - Only one pass over the base table is required.
  - There is no need to write complex `UNION` statements.
  - The more elements `GROUPING SETS` has, the greater is the performance benefit.

GROUPING SETS: **Example**

```
SELECT    department_id, job_id,
          manager_id,AVG(salary)
FROM      employees
GROUP BY GROUPING SETS
((department_id,job_id), (job_id,manager_id));
```

	DEPARTMENT_ID	JOB_ID	MANAGER_ID	AVG(SALARY)
1	(null)	SH_CLERK	122	3200
2	(null)	AC_MGR	101	12000
3	(null)	ST_MAN	100	7280
4	(null)	ST_CLERK	121	2675

...

1

	DEPARTMENT_ID	JOB_ID	MANAGER_ID	AVG(SALARY)
39	110	AC_MGR	(null)	12000
40	90	AD_PRES	(null)	24000
41	60	IT_PROG	(null)	5760
42	100	FI_MGR	(null)	12000

...

2

Composite Columns

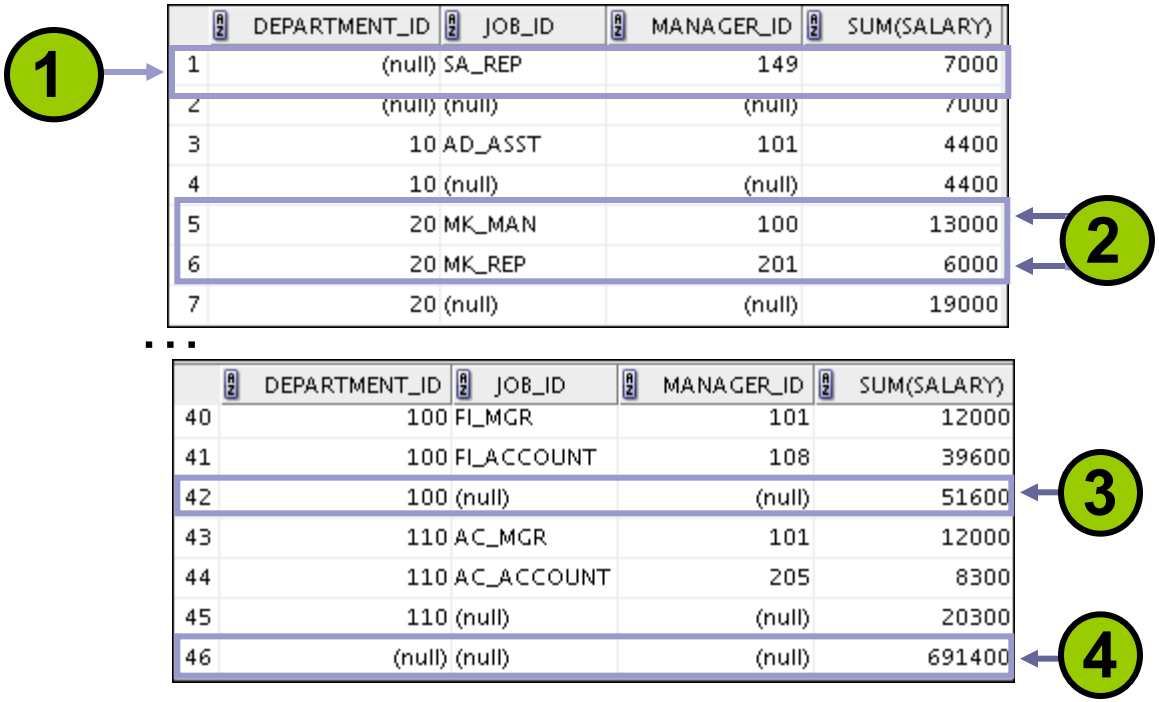
- A composite column is a collection of columns that are treated as a unit.

```
ROLLUP (a, (b, c) , d)
```

- Use parentheses within the `GROUP BY` clause to group columns, so that they are treated as a unit while computing `ROLLUP` or `CUBE` operations.
- When used with `ROLLUP` or `CUBE`, composite columns would require skipping aggregation across certain levels.

Composite Columns: Example

```
SELECT    department_id, job_id, manager_id,
          SUM(salary)
FROM      employees
GROUP BY ROLLUP( department_id,(job_id, manager_id));
```



	DEPARTMENT_ID	JOB_ID	MANAGER_ID	SUM(SALARY)
1	(null)	SA_REP	149	7000
2	(null)	(null)	(null)	7000
3	10	AD_ASST	101	4400
4	10	(null)	(null)	4400
5	20	MK_MAN	100	13000
6	20	MK_REP	201	6000
7	20	(null)	(null)	19000

...

	DEPARTMENT_ID	JOB_ID	MANAGER_ID	SUM(SALARY)
40	100	FI_MGR	101	12000
41	100	FI_ACCOUNT	108	39600
42	100	(null)	(null)	51600
43	110	AC_MGR	101	12000
44	110	AC_ACCOUNT	205	8300
45	110	(null)	(null)	20300
46	(null)	(null)	(null)	691400

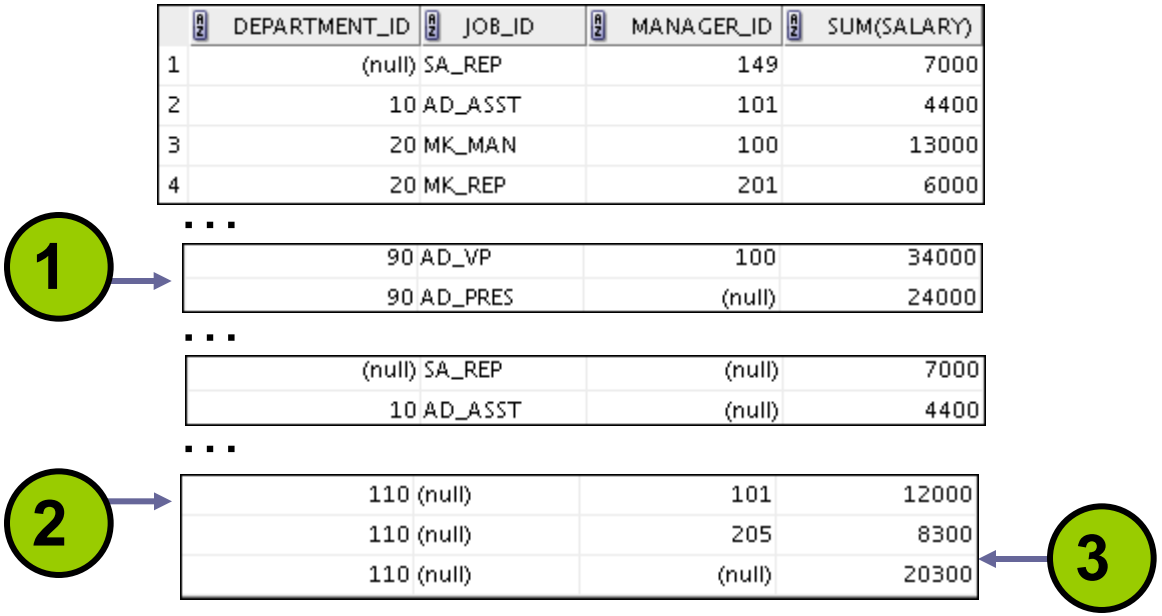
Concatenated Groupings

- Concatenated groupings offer a concise way to generate useful combinations of groupings.
- To specify concatenated grouping sets, you separate multiple grouping sets, `ROLLUP` and `CUBE` operations with commas so that the Oracle Server combines them into a single `GROUP BY` clause.
- The result is a cross-product of groupings from each `GROUPING SET`.

```
GROUP BY GROUPING SETS(a, b), GROUPING SETS(c, d)
```

Concatenated Groupings: Example

```
SELECT    department_id, job_id, manager_id,
          SUM(salary)
FROM      employees
GROUP BY  department_id,
          ROLLUP(job_id),
          CUBE(manager_id);
```



	DEPARTMENT_ID	JOB_ID	MANAGER_ID	SUM(SALARY)
1	(null)	SA_REP	149	7000
2	10	AD_ASST	101	4400
3	20	MK_MAN	100	13000
4	20	MK_REP	201	6000
...				
	90	AD_VP	100	34000
	90	AD_PRES	(null)	24000
...				
	(null)	SA_REP	(null)	7000
	10	AD_ASST	(null)	4400
...				
	110	(null)	101	12000
	110	(null)	205	8300
	110	(null)	(null)	20300