Tutorial 5: Complex SQL (Structured Query Language)

CS3402 Database Systems

BETWEEN … AND … (1/2)

- Find all the employees who earn between $1,200 and $1,400:

```
SELECT Ename, Job, Sal
FROM Emp
WHERE Sal BETWEEN 1200 AND 1400;
```

ENAME	JOB	SAL
Ward	Salesman	1375
Martin	Salesman	1375
Adams	Clerk	1210

- Use comparison operators:

```
SELECT Ename, Job, Sal
FROM Emp
WHERE Sal>=1200 AND Sal<=1400;
```

ENAME	JOB	SAL
Ward	Salesman	1375
Martin	Salesman	1375
Adams	Clerk	1210

BETWEEN … AND … (2/2)

- Find all the employees who earn not between $1,200 and $1,400:

```
SELECT Ename, Job, Sal
FROM Emp
WHERE Sal NOT BETWEEN 1200 AND 1400;
```

```
ENAME           JOB                       SAL
--------------- --------------- ----------
Smith           Clerk                     880
Allen           Salesman                 1760
Jones           Manager                3272.5
Blake           Manager                  3135
Clark           Manager                  2695
Scott           Analyst                  3300
King            President                5500
Turner          Salesman                 1650
James           Clerk                    1045
Ford            Analyst                  3300
Miller          Clerk                    1430

11 rows selected.

SQL>
```

IN and NOT IN

- Find the employees who are clerks, analysts or salesmen:

```
SELECT Ename, Job, Deptno
FROM Emp
WHERE Job IN ('Clerk', 'Analyst', 'Salesman');
```

ENAME	JOB	DEPTNO
Smith	Clerk	20
Allen	Salesman	30
Ward	Salesman	30
Martin	Salesman	30
Scott	Analyst	20
Turner	Salesman	30
Adams	Clerk	20
James	Clerk	30
Ford	Analyst	20
Miller	Clerk	10

- Find the employees who are not clerks, analysts or salesmen:

```
SELECT Ename, Job, Deptno
FROM Emp
WHERE Job NOT IN ('Clerk', 'Analyst',
'Salesman');
```

ENAME	JOB	DEPTNO
Jones	Manager	20
Blake	Manager	30
Clark	Manager	10
King	President	10

LIKE and NOT LIKE (1/2)

- Find all the employees whose names begin with the letter M:

```
SELECT Ename, Job, Deptno
FROM Emp
WHERE Ename LIKE 'M%';
```

ENAME	JOB	DEPTNO
Martin	Salesman	30
Miller	Clerk	10

- Find all the employees whose names end with the letter n:

```
SELECT Ename, Job, Deptno
FROM Emp
WHERE Ename LIKE '%n';
```

ENAME	JOB	DEPTNO
Allen	Salesman	30
Martin	Salesman	30

LIKE and NOT LIKE (2/2)

- Find all the employees whose name are 5 characters long and end with the letter n:

```
SELECT Ename, Job, Deptno
FROM Emp
WHERE Ename LIKE '____n';
```

```
ENAME           JOB                DEPTNO
--------------- --------------- ----------
Allen           Salesman                30

SQL>
```

- Find all the employees whose names are not 5 characters long:

```
SELECT Ename, Job, Deptno
FROM Emp
WHERE Ename NOT LIKE '_____';
```

```
ENAME           JOB                DEPTNO
--------------- --------------- ----------
Ward            Salesman                30
Martin          Salesman                30
King            President               10
Turner          Salesman                30
Ford            Analyst                 20
Miller          Clerk                   10

6 rows selected.
```

Aggregate Functions (1/3)

- Find the average salary for clerks:

```
SELECT AVG(Sal)
FROM Emp
WHERE Job='Clerk';
```

```
  AVG(SAL)
----------
   1141.25

SQL>
```

- Find the total salary and total commission for salesmen:

```
SELECT SUM(Sal), SUM(Comm)
FROM Emp
WHERE Job='Salesman';
```

```
  SUM(SAL)   SUM(COMM)
---------- ----------
      6160       2200

SQL>
```

Aggregate Functions (2/3)

- Compute the average annual salary plus commission for all salesmen:

```
SELECT AVG(Sal+Comm)*12
FROM Emp
WHERE Job='Salesman';
```

AVG(SAL+COMM)*12
26840

- Find the highest and lowest paid employee salaries and the difference between them:

```
SELECT MAX(Sal), MIN(Sal), MAX(Sal)-MIN(Sal)
FROM Emp;
```

MAX(SAL)	MIN(SAL)	MAX(SAL)-MIN(SAL)
5500	880	4620

Aggregate Functions (3/3)

- Find the name and salary of the employee (or employees) who receive the maximum salary:

```
SELECT Ename, Job, Sal
FROM Emp
WHERE Sal=(SELECT MAX(Sal) FROM Emp);
```

```
ENAME          JOB              SAL
-------------- -------------- ----------
King           President          5500

SQL>
```

- Count the number of different jobs held by employees in department 30:

```
SELECT COUNT(DISTINCT Job)
FROM Emp
WHERE Deptno=30;
```

```
COUNT(DISTINCTJOB)
------------------
                 3

SQL>
```

Group By (1/2)

- List the department number and average salary of each department:

```
SELECT Deptno, AVG(Sal)
FROM Emp
GROUP BY Deptno;
```

```
    DEPTNO   AVG(SAL)
---------- ----------
        30 1723.33333
        20     2392.5
        10 3208.33333
```

- Find each department's average annual salary for all its employees except the managers and the president:

```
SELECT Deptno, AVG(Sal)*12
FROM Emp
WHERE Job NOT IN ('Manager', 'President')
GROUP BY Deptno;
```

```
    DEPTNO AVG(SAL)*12
---------- -----------
        30       17292
        20       26070
        10       17160

SQL>
```

Group By (2/2)

- Divide all employees into groups by department, and by jobs within department. Count the employees in each group and compute each group's average annual salary:

```
SELECT Deptno, Job, COUNT(*), AVG(Sal)*12
FROM Emp
GROUP BY Deptno, Job;
```

- Issue the same query as above except list the department name rather than the department number:

```
SELECT Dname, Job, COUNT(*), AVG(Sal)*12
FROM Emp, Dept
WHERE Dept.Deptno=Emp.Deptno
GROUP BY Dname, Job;
```

DEPTNO	JOB	COUNT(*)	AVG(SAL)*12
10	Clerk	1	17160
30	Clerk	1	12540
10	President	1	66000
30	Salesman	4	18480
30	Manager	1	37620
10	Manager	1	32340
20	Analyst	2	39600
20	Clerk	2	12540
20	Manager	1	39270

9 rows selected.

DNAME	JOB	COUNT(*)	AVG(SAL)*12
Accounting	Clerk	1	17160
Research	Clerk	2	12540
Sales	Manager	1	37620
Accounting	Manager	1	32340
Research	Manager	1	39270
Accounting	President	1	66000
Sales	Clerk	1	12540
Research	Analyst	2	39600
Sales	Salesman	4	18480

9 rows selected.

Group By and Having (1/3)

- List the average annual salary for all job groups having more than 2 employees in the group:

```
SELECT Job, COUNT(*), AVG(Sal)*12
FROM Emp
GROUP BY Job
HAVING COUNT(*)>2;
```

JOB	COUNT(*)	AVG(SAL)*12
Clerk	4	13695
Manager	3	36410
Salesman	4	18480

- List all the departments that have at least two clerks:

```
SELECT Deptno
FROM Emp
WHERE Job='Clerk'
GROUP BY Deptno
HAVING COUNT(*)>=2;
```

DEPTNO
20

Group By and Having (2/3)

- Find all departments with an average commission greater than 25% of average salary:

```
SELECT Deptno, AVG(Sal), AVG(Comm), AVG(Sal)*0.25
FROM Emp
GROUP BY Deptno
HAVING AVG(Comm)>AVG(Sal)*0.25;
```

DEPTNO	AVG(SAL)	AVG(COMM)	AVG(SAL)*0.25
30	1723.33333	733.333333	430.833333

- List the job groups that have an average salary greater than the average salary of managers:

```
SELECT Job, AVG(Sal)
FROM Emp
GROUP BY Job
HAVING AVG(Sal)>(SELECT AVG(Sal) FROM Emp
                 WHERE Job='Manager');
```

JOB	AVG(SAL)
Analyst	3300
President	5500

Group By and Having (3/3)

- Count the number of people in department 30 who receive a salary and the number of people who receive a commission.

```
SELECT COUNT(Sal), COUNT(Comm)
FROM Emp
WHERE Deptno=30;
```

COUNT(SAL)	COUNT(COMM)
6	3

- The count of people who receive a salary, 6, is greater than the count of people who receive a commission, 3. This is because null commissions were not counted.

Table Join (1/2)

- Find Allen's name from the EMP table and location of Allen's department from the DEPT table:

```
SELECT Ename, Loc
FROM Emp, Dept
WHERE Ename='Allen' AND Emp.Deptno=Dept.Deptno
ORDER BY Dept.Deptno;
```

ENAME	LOC
Allen	Chicago

- List the department name and all the fields from the employee table for employees that work in Chicago:

```
SELECT Dname, Empno, Ename, Job, Mgr, Hiredate, Sal, Comm, Emp.Deptno
FROM Emp, Dept
WHERE Emp.Deptno=Dept.Deptno
      AND Loc='Chicago'
ORDER BY Emp.Deptno;
```

DNAME	EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
Sales	7499	Allen	Salesman	7698	20-FEB-81	1760	300	30
Sales	7521	Ward	Salesman	7698	22-FEB-81	1375	500	30
Sales	7900	James	Clerk	7698	03-DEC-81	1045		30
Sales	7698	Blake	Manager	7839	01-MAY-91	3135		30
Sales	7844	Turner	Salesman	7698	18-SEP-81	1650		30
Sales	7654	Martin	Salesman	7698	28-SEP-81	1375	1400	30

Table Join (2/2)

- For each employee whose salary exceeds his manager's salary, list the employees' names and salary and the manager's name and salary:

```
SELECT EW.Ename, EW.Sal, EM.Ename, EM.Sal
FROM Emp EW, Emp EM
WHERE EW.Mgr=EM.Empno
AND EW.Sal>EM.Sal;
```

```
ENAME                SAL ENAME                SAL
---------- ---------- ---------- ----------
Ford               3300 Jones              3272.5
Scott              3300 Jones              3272.5

SQL>
```

Subqueries (1/3)

- List the name and job of employees who have the same job as JONES:

```
SELECT Ename, Job FROM Emp
WHERE Job=(SELECT Job FROM
            Emp WHERE Ename='Jones');
```

ENAME	JOB
Jones	Manager
Blake	Manager
Clark	Manager

- Find the employees that earn more than ANY employee in department 30:

```
SELECT DISTINCT Sal, Job, Ename, Deptno
FROM Emp
WHERE Sal>ANY (SELECT Sal FROM Emp
                WHERE Deptno=30)
ORDER BY Sal DESC;
```

SAL	JOB	ENAME	DEPTNO
5500	President	King	10
3300	Analyst	Ford	20
3300	Analyst	Scott	20
3272.5	Manager	Jones	20
3135	Manager	Blake	30
2695	Manager	Clark	10
1760	Salesman	Allen	30
1650	Salesman	Turner	30
1430	Clerk	Miller	10
1375	Salesman	Martin	30
1375	Salesman	Ward	30

SAL	JOB	ENAME	DEPTNO
1210	Clerk	Adams	20

rows selected.

Subqueries (2/3)

- Find the employees that earn more than ALL employees in department 30:

```
SELECT Sal, Job, Ename, Deptno FROM Emp
WHERE Sal > ALL (SELECT Sal FROM Emp
                 WHERE Deptno=30)
ORDER BY Sal DESC;
```

SAL	JOB	ENAME	DEPTNO
5500	President	King	10
3300	Analyst	Scott	20
3300	Analyst	Ford	20
3272.5	Manager	Jones	20

- Find all the employees in department 10 that have a job that is the same as anyone in department 30:

```
SELECT Ename, Job FROM Emp
WHERE Deptno=10
AND Job IN (SELECT Job FROM Emp
            WHERE Deptno=30);
```

ENAME	JOB
Clark	Manager
Miller	Clerk

Subqueries (3/3)

- List the name, job title, and salary of employees who have the same job and salary as Ford:

```
SELECT Ename, Job, Sal
FROM Emp
WHERE (Job,Sal)=(SELECT Job, Sal FROM Emp
                 WHERE Ename='Ford');
```

ENAME	JOB	SAL
Scott	Analyst	3300
Ford	Analyst	3300

- List the name, job, and department of employees who have the same job as Jones, or a salary greater than or equal to Ford:

```
SELECT Ename, Job, Deptno, Sal FROM Emp
WHERE Job IN (SELECT Job FROM Emp
              WHERE Ename='Jones')
OR Sal>=(SELECT Sal FROM Emp
         WHERE Ename='Ford')
ORDER BY Job, Sal;
```

ENAME	JOB	DEPTNO	SAL
Scott	Analyst	20	3300
Ford	Analyst	20	3300
Clark	Manager	10	2695
Blake	Manager	30	3135
Jones	Manager	20	3272.5
King	President	10	5500