# 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 Martin	Salesman Salesman	1375 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
Cmi+h	Glonk	
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:

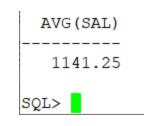
```
SELECT Ename, Job, Deptno
FROM Emp
WHERE Ename NOT LIKE '____';
```

ENAME		JOB	DEPTNO
Ward Martin		Salesman Salesman	30 30
King		President	10
Turner		Salesman	30
Ford		Analyst	20
Miller		Clerk	10
6 rows	selected.		

#### Aggregate Functions (1/3)

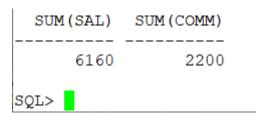
• Find the average salary for clerks:

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



• Find the total salary and total commission for salesmen:

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



### Aggregate Functions (2/3)

 Compute the average annual salary plus commission for all salesmen:

```
SELECT AVG(Sal+Comm) *12

FROM Emp

WHERE Job='Salesman';
```

 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)

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:

[ENAME]

JOB

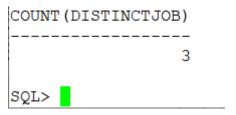
```
SELECT Ename, Job, Sal

FROM Emp

WHERE Sal=(SELECT MAX(Sal) FROM Emp);
```

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

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



#### **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 1723.333333
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
	17000
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

<sup>9</sup> 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
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#### 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;
```

HAVING COUNT (\*) >= 2;

List all the departments that have at least two clerks:

```
SELECT Deptno

FROM Emp

WHERE Job='Clerk'

GROUP BY Deptno
```

#### 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

30 1723.33333 733.33333 430.833333

HAVING AVG(Comm)>AVG(Sal)*0.25;
```

 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');
```

#### 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;
```

• 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;
```

 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
                                               DNAME
                                                               EMPNO ENAME
                                                                                JOB
                                                                                                                 SAL
                                                                                                 MGR HIREDATE
                                                                                                                                DEPTNO
WHERE Emp.Deptno=Dept.Deptno
                                               Sales
                                                                7499 Allen
                                                                                                                1760
                                                                                Salesman
                                                                                                 7698 20-FEB-81
                                               Sales
                                                                7521 Ward
                                                                                Salesman
                                                                                                7698 22-FEB-81
                                                                                                                1375
         AND Loc='Chicago'
                                               Sales
                                                                7900 James
                                                                                Clerk
                                                                                                7698 03-DEC-81
                                                                                                                1045
                                               Sales
                                                                7698 Blake
                                                                                                7839 01-MAY-91
                                                                                                                3135
                                                                                                                                   30
                                                                                Manager
                                                                                                                1650
                                               Sales
                                                                7844 Turner
                                                                                Salesman
                                                                                                7698 18-SEP-81
                                                                                                                                   30
ORDER BY Emp. Deptno;
                                               Sales
                                                                7654 Martin
                                                                                                7698 28-SEP-81
                                                                                                                1375
                                                                                Salesman
                                                                                                                         1400
```

### 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;

Sal ENAME

Ford
Scott
SQL>

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

Jones

Blake

Clark
```

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

SELECT	T DISTING	CT Sal,	Job,	Ename,	Deptno
FROM E	Emp				
WHERE	Sal>ANY	(SELEC	r Sal	FROM E	mp
WHERE Deptno=30)					
ORDER	BY Sal I	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

JOB

Manager

Manager

Manager

rows selected.

# Subqueries (2/3)

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

SELECT Sal, Job, Ename, Deptno FROM Emp	SAL JOB	ENAME	DEPTNO
WHERE Sal > ALL (SELECT Sal FROM Emp	5500 President	King	10
	3300 Analyst	Scott	20
WHERE Deptno=30)	3300 Analyst	Ford	20
ORDER BY Sal DESC:	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:

# 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
```

• 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	ENAME	JOB	DEPTNO	SAL
WHERE Job IN (SELECT Job FROM Emp	Scott	Analyst	20	3300
<pre>WHERE Ename='Jones')</pre>	Ford	Analyst	20	3300
OR Sal>=(SELECT Sal FROM Emp	Clark	Manager	10	2695
ON Salv-(SEDECT Sal PROM Emp	Blake	Manager 30	30	3135
WHERE Ename='Ford')	Jones	Manager	20	3272.5
ORDER BY Job, Sal;	King	President	10	5500