

Databases

Other operations in SQL, the DDL and DML

Relational Algebra operations

| | |
|-------------------|-----------|
| Selection | σ |
| Projection | π |
| Cartesian Product | \times |
| Union | \cup |
| Set Difference | $-$ |
| Join | \bowtie |
| Intersection | \cap |
| Division | \div |

Find all values

UNION

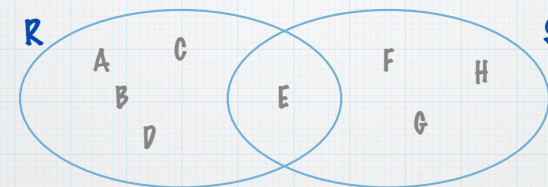
$R \cup S$

A set, every member of which is an element of one or another of two or more given sets.

All the distinct values from the 'first' set along with all the distinct values in the 'second' set

UNION

$R \cup S$



$R \cup S = \{A, B, C, D, E, F, G, H\}$

RA example

Create a list of all the **hisals** and **losals**

list of all the **hisals**

$\pi_{\text{hisals}}(\text{grade})$

| hisal |
|-------|
| 21999 |
| 23999 |
| 29999 |
| 49999 |
| 99999 |

RA example

Create a list of all the **hisals** and **losals**

list of all the **losals**

$\pi_{\text{losals}}(\text{grade})$

| losal |
|-------|
| 17000 |
| 22000 |
| 24000 |
| 30000 |
| 50000 |

RA example

Create a list of all the **hisals** and **losals**

$\pi_{\text{losals}}(\text{grade})$

∪

$\pi_{\text{hisals}}(\text{grade})$

| |
|-------|
| 21999 |
| 23999 |
| 29999 |
| 49999 |
| 99999 |
| 17000 |
| 22000 |
| 24000 |
| 30000 |
| 50000 |

SQL example

Create a list of all the **hisals** and **losals**

select hisal from grade

union

select losal from grade

| |
|-------|
| 21999 |
| 23999 |
| 29999 |
| 49999 |
| 99999 |
| 17000 |
| 22000 |
| 24000 |
| 30000 |
| 50000 |

Relational Algebra operations

| | |
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| Selection | σ |
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Find values in one set
but not in another

SET DIFFERENCE

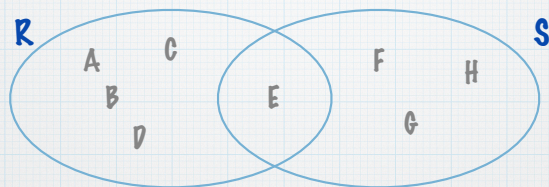
R - S

A set, every member of which is in one particular set but not another

All the distinct values from the 'first' set without all the distinct values in the 'second' set

SET DIFFERENCE

R - S



$$R - S = \{A, B, C, D\}$$

RA example

Create a list of actual salaries excluding any that are earning the highest value for the grade

list of all the hisals

π hisals (grade)

| hisal |
|-------|
| 21999 |
| 23999 |
| 29999 |
| 49999 |
| 99999 |

RA example

Create a list of actual salaries excluding any that are earning the highest value for the grade

list of all the salaries

$$\pi_{sal}(emp)$$

| SAL |
|-------|
| 18000 |
| 26000 |
| 22500 |
| 39750 |
| 22500 |
| 38500 |
| 34500 |
| 40000 |
| 60000 |
| 25000 |
| 21000 |
| 19500 |
| 40000 |
| 23000 |

RA example

Create a list of actual salaries excluding any that are earning the highest value for the grade

$$\pi_{sal}(emp) - \pi_{hisals}(grade)$$

Done using the SQL keyword **minus** - unfortunately not many PC databases support this syntax

Relational Algebra operations

| | |
|-------------------|-----------|
| Selection | σ |
| Projection | π |
| Cartesian Product | \times |
| Union | \cup |
| Set Difference | $-$ |
| Join | \bowtie |
| Intersection | \cap |
| Division | \div |

Done using CP and selection

Relational Algebra operations

| | |
|-------------------|-----------|
| Selection | σ |
| Projection | π |
| Cartesian Product | \times |
| Union | \cup |
| Set Difference | $-$ |
| Join | \bowtie |
| Intersection | \cap |
| Division | \div |

Not really implemented in databases as can be done by selection

Relational Algebra operations

| | |
|-------------------|-----------|
| Selection | σ |
| Projection | π |
| Cartesian Product | \times |
| Union | \cup |
| Set Difference | $-$ |
| Join | \bowtie |
| Intersection | \cap |
| Division | \div |

Not really implemented in databases as expensive to implement

Data Query Language (DQL)

The SQL shown so far is for writing queries - the DQL part of the language

```
select * or expression
from relations
[where expression]
```

DDL and DML

SQL also has a syntax for creating tables, altering the structure of tables and deleting tables - called the Data Definition Language (DDL)

SQL also has a syntax for inserting rows, updating and deleting rows - called the Data Manipulation Language (DML)

Data Definition Language (DDL)

Creating a table

```
CREATE TABLE tablename
(column_name type [NULL/NOT NULL],
column_name type [NULL/NOT NULL],
...)
```


Data Definition Language (DDL)

type(s)

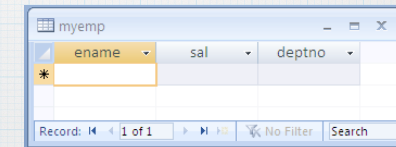
| | |
|-------------|---|
| CHAR (size) | Character data, maximum of 'size' characters upto 240 |
| DATE | Dates (which include time) |
| LONG | Character data up to 65535 (some restrictions may apply on the use of this field in a select statement) |
| NUMBER | Maximum of 40 digits (will accept scientific notation) |

Data Definition Language (DDL)

Creating a table

```
CREATE TABLE tablename  
(column_name type [NULL/NOT NULL],  
column_name type [NULL/NOT NULL],  
...)
```

```
create table myemp  
(ename char,  
sal number,  
deptno number)
```



| ename | sal | deptno |
|-------|-----|--------|
| * | | |

Data Manipulation Language (DML)

Inserting a record

```
insert into table [(columnname, columnname, ...)]  
values (value, value,...)
```

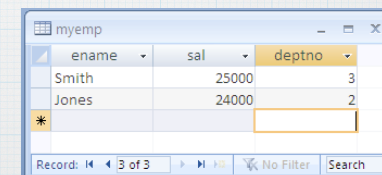
```
insert into table  
values (value, value,...)
```

Data Manipulation Language (DML)

Inserting a record

```
insert into myemp (ename, sal, deptno)  
values ("smith", 25000, 3)
```

```
insert into myemp  
values ("jones", 24000, 2)
```



| ename | sal | deptno |
|-------|-------|--------|
| Smith | 25000 | 3 |
| Jones | 24000 | 2 |
| * | | |

Data Manipulation Language (DML)

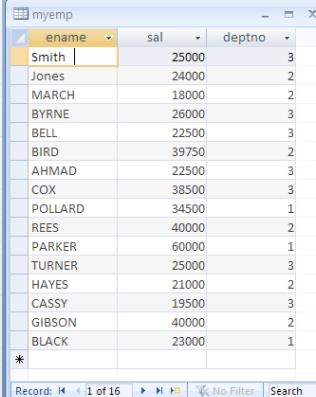
Inserting records from other tables

```
insert into table [(columnname, columnname, ...)]  
select expression
```

Data Manipulation Language (DML)

Copies records from another table

```
insert into myemp (ename,  
sal, deptno)  
select ename, sal, deptno  
from emp
```



| ename | sal | deptno |
|---------|-------|--------|
| Smith | 25000 | 3 |
| Jones | 24000 | 2 |
| MARCH | 18000 | 2 |
| BYRNE | 26000 | 3 |
| BELL | 22500 | 3 |
| BIRD | 39750 | 2 |
| AHMAD | 22500 | 3 |
| COX | 38500 | 3 |
| POLLARD | 34500 | 1 |
| REES | 40000 | 2 |
| PARKER | 60000 | 1 |
| TURNER | 25000 | 3 |
| HAYES | 21000 | 2 |
| CASSY | 19500 | 3 |
| GIBSON | 40000 | 2 |
| BLACK | 23000 | 1 |

Data Manipulation Language (DML)

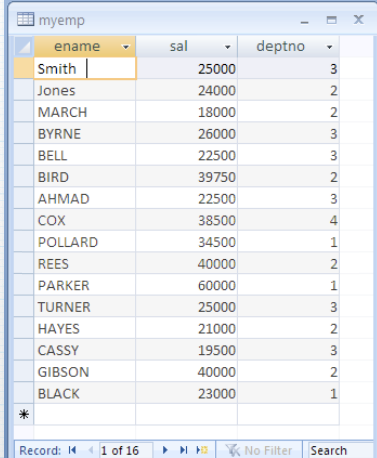
Updating record(s)

```
update tablename set name = value [(,name=value)]  
[where expression]
```

Data Manipulation Language (DML)

Updating record(s)

```
update myemp set deptno = 4  
where ename = "Cox"
```



| ename | sal | deptno |
|---------|-------|--------|
| Smith | 25000 | 3 |
| Jones | 24000 | 2 |
| MARCH | 18000 | 2 |
| BYRNE | 26000 | 3 |
| BELL | 22500 | 3 |
| BIRD | 39750 | 2 |
| AHMAD | 22500 | 3 |
| COX | 38500 | 4 |
| POLLARD | 34500 | 1 |
| REES | 40000 | 2 |
| PARKER | 60000 | 1 |
| TURNER | 25000 | 3 |
| HAYES | 21000 | 2 |
| CASSY | 19500 | 3 |
| GIBSON | 40000 | 2 |
| BLACK | 23000 | 1 |

Data Manipulation Language (DML)

Updating record(s)

update myemp set sal = sal * 1.1
where ename = "Pollard"
or ename = "Rees"

| ename | sal | deptno |
|---------|-------|--------|
| Smith | 25000 | 3 |
| Jones | 24000 | 2 |
| MARCH | 18000 | 2 |
| BYRNE | 26000 | 3 |
| BELL | 22500 | 3 |
| BIRD | 39750 | 2 |
| AHMAD | 22500 | 3 |
| COX | 38500 | 4 |
| POLLARD | 37950 | 1 |
| REES | 44000 | 2 |
| PARKER | 60000 | 1 |
| TURNER | 25000 | 3 |
| HAYES | 21000 | 2 |
| CASSY | 19500 | 3 |
| GIBSON | 40000 | 2 |
| BLACK | 23000 | 1 |

Data Manipulation Language (DML)

Deleting record(s)

delete * from tablename
[where expression]

Data Manipulation Language (DML)

Deleting Pollard

delete * from myemp
where ename = "Cox"

| ename | sal | deptno |
|---------|-------|--------|
| Smith | 25000 | 3 |
| Jones | 24000 | 2 |
| MARCH | 18000 | 2 |
| BYRNE | 26000 | 3 |
| BELL | 22500 | 3 |
| BIRD | 39750 | 2 |
| AHMAD | 22500 | 3 |
| COX | 38500 | 4 |
| POLLARD | 37950 | 1 |
| REES | 44000 | 2 |
| PARKER | 60000 | 1 |
| TURNER | 25000 | 3 |
| HAYES | 21000 | 2 |
| CASSY | 19500 | 3 |
| GIBSON | 40000 | 2 |
| BLACK | 23000 | 1 |

Data Manipulation Language (DML)

Deleting Pollard

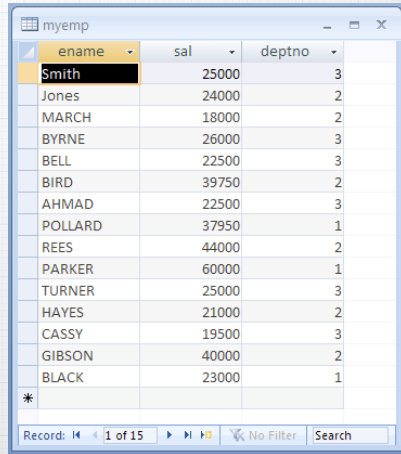
delete * from myemp
where ename = "Cox"

| ename | sal | deptno |
|---------|-------|--------|
| Smith | 25000 | 3 |
| Jones | 24000 | 2 |
| MARCH | 18000 | 2 |
| BYRNE | 26000 | 3 |
| BELL | 22500 | 3 |
| BIRD | 39750 | 2 |
| AHMAD | 22500 | 3 |
| POLLARD | 37950 | 1 |
| REES | 44000 | 2 |
| PARKER | 60000 | 1 |
| TURNER | 25000 | 3 |
| HAYES | 21000 | 2 |
| CASSY | 19500 | 3 |
| GIBSON | 40000 | 2 |
| BLACK | 23000 | 1 |

Data Manipulation Language (DML)

Watch out:
Deleting everything

`delete * from myemp`

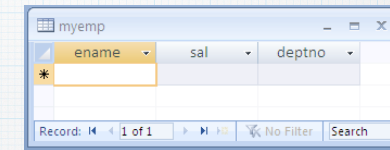


| ename | sal | deptno |
|---------|-------|--------|
| Smith | 25000 | 3 |
| Jones | 24000 | 2 |
| MARCH | 18000 | 2 |
| BYRNE | 26000 | 3 |
| BELL | 22500 | 3 |
| BIRD | 39750 | 2 |
| AHMAD | 22500 | 3 |
| POLLARD | 37950 | 1 |
| REES | 44000 | 2 |
| PARKER | 60000 | 1 |
| TURNER | 25000 | 3 |
| HAYES | 21000 | 2 |
| CASSY | 19500 | 3 |
| GIBSON | 40000 | 2 |
| BLACK | 23000 | 1 |

Data Manipulation Language (DML)

Watch out:
Deleting everything

`delete * from myemp`



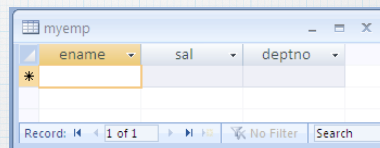
| ename | sal | deptno |
|-------|-----|--------|
| * | | |

Data Definition Language (DDL)

Deleting a table - we say "dropping a table"

`DROP TABLE tablename`

`drop table myemp`



| ename | sal | deptno |
|-------|-----|--------|
| * | | |