Database Systems

Lecture

Physical Database Design using SQL

SELECT

```
SELECT   A1,A2,…,An
FROM     Table1,Table2,…,Tablen
WHERE    Condition
```

SELECT

- Show all attributes for employees who work in D_1 department

```
SELECT    *
FROM      Employee
WHERE     Dept = 'D_1';
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

SELECT

- Show only Names and DOJ of employees who joined after 31-3-2020

```
SELECT    Name, DoJ
FROM          Employee
WHERE         DoJ > ’2020-03-31’;
```

Resultset

Name	DoJ
Charles	2020-05-04
James	2020-05-06
Chris	2020-06-12
Shaun	2020-06-12
David	2020-06-19

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

SELECT

- Show only addresses for employees

```
SELECT Address
FROM   Employee;
```

Resultset

Address
Street 1
Street 2
Street 1
Street 9
Street 4
Street 3
Street 7
Street 2
Street 5

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

SELECT

- Show only addresses for employees

```
SELECT Address
FROM   Employee;
```

We get duplicates!

Resultset

Address
Street 1
Street 2
Street 1
Street 9
Street 4
Street 3
Street 7
Street 2
Street 5

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

SELECT DISTINCT

- Show only distinct addresses for employees

```
SELECT DISTINCT Address
FROM      Employee;
```

Resultset

Address
Street 1
Street 2
Street 9
Street 4
Street 3
Street 7
Street 5

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

ORDER BY

- Show all data about employees order by Name

```
SELECT * FROM Employee ORDER BY Name;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_167	2020-06-12	Chris	Street 7	D_1
E_172	2020-06-19	David	Street 5	NULL
E_155	2020-05-06	James	Street 3	D_1
E_112	2020-02-12	John	Street 1	D_2
E_144	2020-03-08	Mark	Street 1	D_4
E_168	2020-06-12	Shaun	Street 2	D_3

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

ORDER BY DESC

- Show all data about employees order by Name (descending)

```
SELECT * FROM Employee ORDER BY Name DESC;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_168	2020-06-12	Shaun	Street 2	D_3
E_144	2020-03-08	Mark	Street 1	D_4
E_112	2020-02-12	John	Street 1	D_2
E_155	2020-05-06	James	Street 3	D_1
E_172	2020-06-19	David	Street 5	NULL
E_167	2020-06-12	Chris	Street 7	D_1
E_152	2020-05-04	Charles	Street 4	D_2
E_149	2020-03-08	Bill	Street 9	D_3
E_134	2020-03-08	Andy	Street 2	NULL

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

LIKE

- Show all data about employees whose name starts with ‘J’

```
SELECT * FROM Employee WHERE Name LIKE ‘J%’;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_155	2020-05-06	James	Street 3	D_1

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

LIKE

- Show all data about employees whose name ends with ‘les’

```
SELECT * FROM Employee WHERE Name LIKE ‘%les’;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_152	2020-05-04	Charles	Street 4	D_2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

LIKE

- Show all data about employees whose name starts with ‘A’ or ‘B’

```
SELECT * FROM Employee WHERE Name LIKE ‘[ab]%’;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

LIKE

- Show all data about employees whose EmpID has ‘5’ in second digit

```
SELECT * FROM Employee WHERE EmpID LIKE ‘___5_’;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

LIKE

- Show all data about employees whose EmpID has ‘5’ in second digit

```
SELECT * FROM Employee WHERE EmpID LIKE ‘%5_’;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

LIKE

- Show employees whose EmpID does NOT have ‘5’ in second digit

```
SELECT * FROM Employee WHERE EmpID NOT LIKE ‘___5_’;
```

Resultset

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

Join

- Show Names of employees and their departments

```
SELECT    Emplpoyee.Name, Department.DName
FROM          Employee, Department
WHERE         Employee.Dept = Department.DepID;
```

Resultset

Employee.Name	Department.DName
John	Marketing
Bill	Production
Charles	Marketing
James	Sales
Chris	Sales
Shaun	Production

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

Join

- Show Names of employees and their departments

Too cluttered!

```
SELECT    Emplpoyee.Name, Department.DName
FROM          Employee, Department
WHERE         Employee.Dept = Department.DepID;
```

Too cluttered!

Resultset

Employee.Name	Department.DName
John	Marketing
Bill	Production
Charles	Marketing
James	Sales
Chris	Sales
Shaun	Production

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

Join

- Show Names of employees and their departments


```
SELECT    Emplpoyee.Name, Department.DName
FROM          Employee, Department
WHERE         Employee.Dept = Department.DepID;
```

Resultset

Employee.Name	Department.DName
John	Marketing
Bill	Production
Charles	Marketing
James	Sales
Chris	Sales
Shaun	Production

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

Aliases

- Show Names of employees and their departments

```
SELECT    E.Name, D.DName
FROM          Employee AS E, Department AS D
WHERE         E.Dept = D.DepID;
```

Alias for table names

Resultset

E.Name	D.DName
John	Marketing
Bill	Production
Charles	Marketing
James	Sales
Chris	Sales
Shaun	Production

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

Aliases

- Show Names of employees and their departments

```
SELECT    E.Name AS Name, D.DName AS Dept
FROM          Employee AS E, Department AS D
WHERE         E.Dept = D.DepID;
```

← Alias for column names

Resultset

Name	Dept
John	Marketing
Bill	Production
Charles	Marketing
James	Sales
Chris	Sales
Shaun	Production

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

Aggregate Functions

- Used to perform summary calculations on data
- Examples:
  - How many employees work in the organization?
  - How many employees work in each department?
  - What is the maximum salary of an employee?
  - What is the average CGPA for each batch of the BS Program?
- Each aggregate function can be applied to one column, and returns a single value
- Includes COUNT, SUM, AVG, MAX, MIN
- Commonly used with GROUP BY to perform summary on groups

Aggregate Functions

- Show the number of employees in the organization

```
SELECT    COUNT (*)
FROM      Employee;
```

Resultset

COUNT(*)
9

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

Aggregate Functions

- Show the number of employees in the organization

Only allowed for COUNT

```
SELECT    COUNT (*)
FROM            Employee;
```

Resultset

COUNT(*)
9

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

Aggregate Functions

- Show the senior-most employee in the organization

```
SELECT    Name, MIN (DOJ)
FROM      Employee;
```

Resultset

Name	MIN (DoJ)
John	2020-02-12

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

GROUP BY

- Show how many employees work in each department

```
SELECT    Dept, COUNT (*)
FROM      Employee
GROUP BY Dept
ORDER BY Dept;
```

Resultset

Dept	COUNT(*)
D_1	2
D_2	2
D_3	2
D_4	1
NULL	2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

GROUP BY

- Show how many employees work in each department

```
SELECT    Dept, COUNT (*)
FROM      Employee
GROUP BY  Dept
ORDER BY  Dept;
```

Aggregate function!

Resultset

Dept	COUNT(*)
D_1	2
D_2	2
D_3	2
D_4	1
NULL	2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

GROUP BY

- Show the senior-most employee in each department

```
SELECT    Dept, Name, MIN (DoJ)
FROM      Employee
GROUP BY Dept
ORDER BY Dept;
```

Resultset

Dept	Name	MIN(DOJ)
D_1	James	2020-05-06
D_2	John	2020-02-12
D_3	Bill	2020-03-08
D_4	Mark	2020-03-08
NULL	Andy	2020-03-08

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

GROUP BY

- Show the senior-most employee in each department

```
SELECT    Dept, Name, MIN (DoJ)
FROM      Employee
GROUP BY  Dept
ORDER BY  Dept;
```

Aggregate function!

Resultset

Dept	Name	MIN(DOJ)
D_1	James	2020-05-06
D_2	John	2020-02-12
D_3	Bill	2020-03-08
D_4	Mark	2020-03-08
NULL	Andy	2020-03-08

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

GROUP BY

- When specifying columns in a SELECT statement with GROUP BY clause, it makes sense to include only those columns which are either part of the aggregate function, or are included in GROUP BY…

GROUP BY

- This query does not make sense… why?

```
SELECT    Dept, Name, COUNT(*)
FROM      Employee
GROUP BY  Dept
ORDER BY  Dept;
```

What would SQL show in this column?

Resultset

Dept	Name	COUNT(*)
D_1	James	2
D_2	John	2
D_3	Bill	2
D_4	Mark	1
NULL	Andy	2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

HAVING

- WHERE is used to specify conditions for SELECT command
- HAVING is used to specify conditions for GROUP BY command

```
SELECT    Dept, COUNT(*)
FROM      Employee
GROUP BY  Dept
HAVING    COUNT(*) > 1;
```

Resultset

Dept	COUNT(*)
D_1	2
D_2	2
D_3	2
NULL	2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_144	2020-03-08	Mark	Street 1	D_4
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3
E_172	2020-06-19	David	Street 5	NULL

SUBQUERIES

- Sometimes a query needs the results of another subquery to generate its output
- Sometimes the query is so complex that it is better to divide it into multiple subqueries
- The general form of a query involving subquery is:

```
SELECT      A1, A2,…, An
FROM        (SELECT AA1, AA2,…, AAn
             FROM Table
             WHERE Condition1)
WHERE       Condition2
```

Outer query

Subquery
or Inner query

- The subquery can be included in FROM or WHERE part of outer query

SUBQUERIES

- Show Names of employees who work in Marketing department

```
SELECT      Name
FROM        Employee
WHERE       Dept = (SELECT DepID FROM Department
                    WHERE   DName = 'Marketing');
```

```
Select e.name
From employee e, department d
Where e.dept=d.depid And
d.dname = 'marketing';
```

Resultset

Name
John
Charles

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

SUBQUERIES

- Show Location where the senior-most employee works

```
SELECT    Location
FROM      Department
WHERE     DepID = (SELECT Dept from Employee WHERE DoJ =
                   (SELECT MIN(DOJ)
                    FROM Employee));
```

Resultset

Location
Site 1

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

SUBQUERIES

- Show Location where the senior-most employee works

```
SELECT    Location
FROM      Department
WHERE     DepID = (SELECT Dept from Employee WHERE DoJ =
           (SELECT MIN(DOJ)
            FROM Employee));
```

First, the innermost query will execute

Resultset

Location
Site 1

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

SUBQUERIES

- Show Location where the senior-most employee works

```
SELECT    Location
FROM      Department
WHERE     DepID = (SELECT Dept from Employee WHERE DoJ =
                   (SELECT MIN(DOJ)
                    FROM Employee));
```

Then this query will execute

Resultset

Location
Site 1

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

SUBQUERIES

- Show Location where the senior-most employee works

```
SELECT    Location
FROM      Department
WHERE     DepID = (SELECT Dept from Employee WHERE DoJ =
                   (SELECT MIN(DOJ)
                    FROM Employee));
```

Finally the outermost query will execute

Resultset

Location
Site 1

DEPARTMENT

DepID	DName	Location
D_1	Sales	Site 1
D_2	Marketing	Site 1
D_3	Production	Site 2

EMPLOYEE

EmpID	DoJ	Name	Address	Dept
E_112	2020-02-12	John	Street 1	D_2
E_134	2020-03-08	Andy	Street 2	NULL
E_149	2020-03-08	Bill	Street 9	D_3
E_152	2020-05-04	Charles	Street 4	D_2
E_155	2020-05-06	James	Street 3	D_1
E_167	2020-06-12	Chris	Street 7	D_1
E_168	2020-06-12	Shaun	Street 2	D_3

SUBQUERIES

- Show employees who earn more than average salary
- Show employees who earn more than the salary of employees whose address is street 2

```
SELECT      *
FROM        Employee
WHERE       Salary >= (SELECT AVG(Salary) FROM Employee);
```

Resultset

EmpID	DoJ	Name	Address	Salary
E_112	2020-02-12	John	Street 1	4000
E_134	2020-03-08	Andy	Street 2	6000
E_155	2020-05-06	James	Street 3	5000
E_167	2020-06-12	Chris	Street 7	4000

EMPLOYEE

EmpID	DoJ	Name	Address	Salary
E_112	2020-02-12	John	Street 1	4000
E_134	2020-03-08	Andy	Street 2	6000
E_149	2020-03-08	Bill	Street 9	3000
E_152	2020-05-04	Charles	Street 4	3000
E_155	2020-05-06	James	Street 3	5000
E_167	2020-06-12	Chris	Street 7	4000
E_168	2020-06-12	Shaun	Street 2	3000

Thanks a lot