Practical Application of the SQL SELECT Statement

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Using SELECT... FROM...
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SELECT… FROM…

So far:

SELECT… FROM…

So far:

- Theory of Relational Databases
- SQL Theory
- Creating SQL Databases and Tables
- Creating SQL Constraints

SELECT… FROM…

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- Theory of Relational Databases
- SQL Theory
- Creating SQL Databases and Tables
- Creating SQL Constraints

In this section:

SELECT… FROM…

So far:

- Theory of Relational Databases
- SQL Theory
- Creating SQL Databases and Tables
- Creating SQL Constraints

In this section:

- Data Manipulation

SELECT… FROM…

- the SELECT statement

SELECT… FROM…

- the SELECT statement

  allows you to extract a fraction of the entire data set

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  - used to retrieve data from database objects, like tables

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- the SELECT statement

  allows you to extract a fraction of the entire data set

  - used to retrieve data from database objects, like tables
  - used to *“query data from a database”*

SELECT… FROM…

SQL

```
SELECT column_1, column_2,… column_n
FROM table_name;
```

SELECT… FROM…


```
SELECT column_1, column_2,… column_n
FROM table_name;
```

- when extracting information, SELECT goes with FROM

SELECT… FROM…

SQL

```
SELECT column_1, column_2,… column_n
FROM table_name;
```

SELECT… FROM…

SQL

```
SELECT column_1, column_2,… column_n
FROM table_name;
```

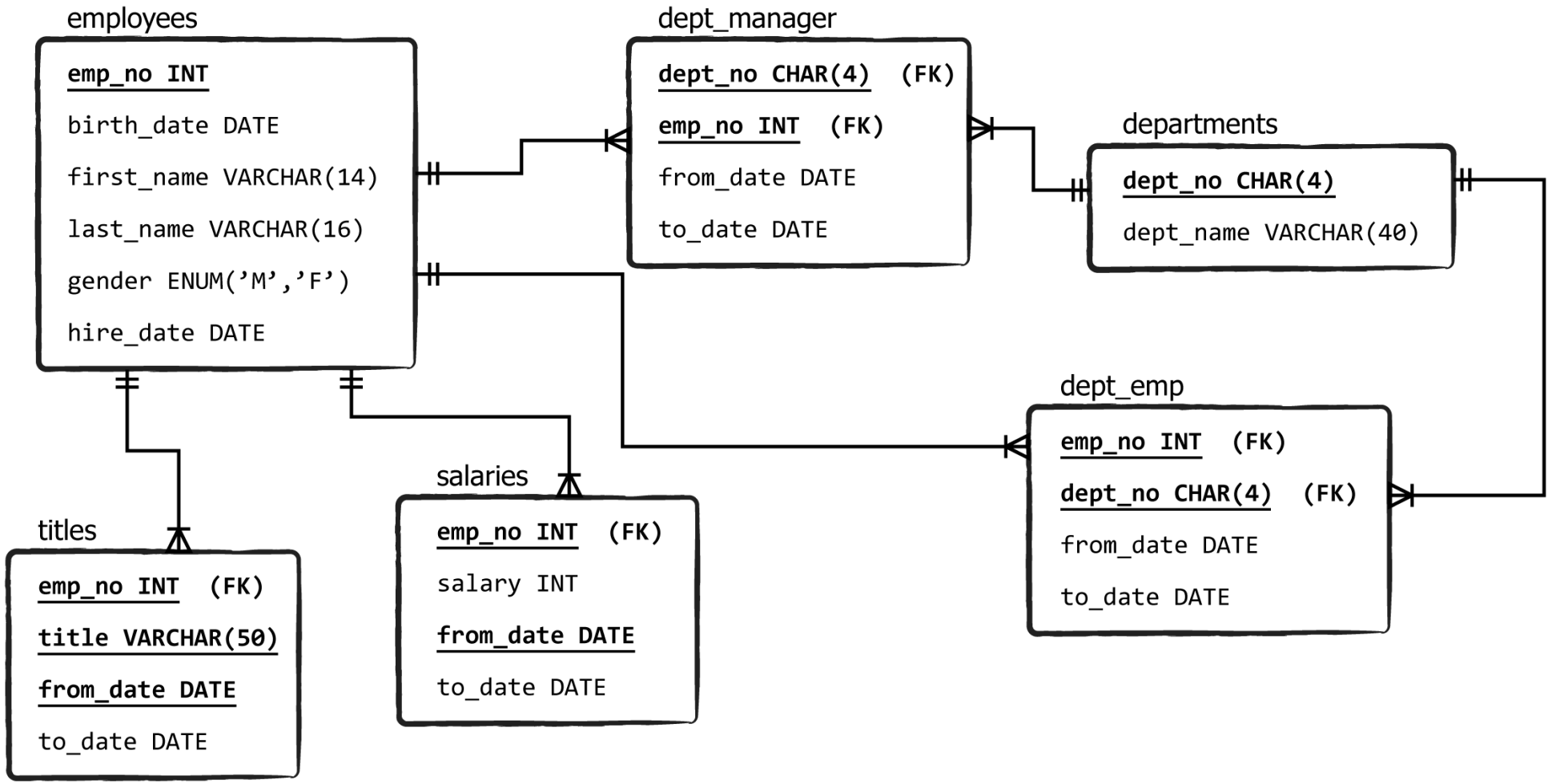
```
SELECT first_name, last_name
FROM employees;
```

SELECT… FROM…


```sql
SELECT * FROM employees;
```

* - a wildcard character, means “all” and “everything”

Database: employees



The Business Intelligence Analyst Course

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Using WHERE

WHERE

SQL

```sql
SELECT * FROM employees;
```

WHERE

SQL

```
SELECT column_1, column_2,… column_n
FROM table_name;
```

WHERE

- the WHERE clause

WHERE

- the WHERE clause

  it will allow us to set a condition upon which we will specify what part of the data we want to retrieve from the database

WHERE

- **the WHERE clause**

  it will allow us to set a condition upon which we will specify what part of the data we want to retrieve from the database


```
SELECT column_1, column_2,… column_n
FROM table_name;
```

WHERE

- **the WHERE clause**

  it will allow us to set a condition upon which we will specify what part of the data we want to retrieve from the database

SQL

```
SELECT column_1, column_2,… column_n
FROM table_name
WHERE condition;
```


AND

AND

- = equal operator

AND

- = equal operator

in SQL, there are many other *linking keywords and symbols*, called operators, that you can use with the WHERE clause

AND

= equal operator

in SQL, there are many other *linking keywords and symbols*, called operators, that you can use with the WHERE clause

- AND
- OR
- IN - NOT IN
- LIKE - NOT LIKE
- BETWEEN… AND…

AND

= equal operator

in SQL, there are many other *linking keywords and symbols*, called operators, that you can use with the WHERE clause

- AND
- OR
- IN
- NOT IN
- LIKE
- NOT LIKE
- BETWEEN… AND…
- EXISTS
- NOT EXISTS
- IS NULL
- IS NOT NULL
- comparison operators
- etc.

AND

AND

AND

AND

allows you to logically combine two statements in the condition code block

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allows you to logically combine two statements in the condition code block


```
SELECT column_1, column_2,… column_n
FROM table_name
WHERE condition_1 AND condition_2;
```

AND

AND

allows you to logically combine two statements in the condition code block


```
SELECT column_1, column_2,… column_n
FROM table_name
WHERE condition_1 AND condition_2;
```

- allows us to *narrow* the output we would like to extract from our data


OR

OR

AND

AND binds SQL to meet both conditions enlisted in the WHERE clause *simultaneously*


```
SELECT column_1, column_2,… column_n
FROM table_name
WHERE condition_1 AND condition_2;
```

OR

AND

conditions set on *different* columns

OR

- **AND**

  conditions set on *different* columns

- **OR**

  conditions set on *the same* column

Operator Precedence

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Operator Precedence

So far:

Operator Precedence

So far:

- AND
- OR

Operator Precedence

So far:

- AND
- OR

In this lesson:

Operator Precedence

So far:

- AND
- OR

In this lesson:

- the *logical order* with which you must comply when you use both operators in the same WHERE block

Operator Precedence

- logical operator precedence

Operator Precedence

logical operator precedence

an SQL rule stating that in the execution of the query, the operator AND is applied first, while the operator OR is applied second

Operator Precedence

logical operator precedence

an SQL rule stating that in the execution of the query, the operator AND is applied first, while the operator OR is applied second

AND > OR

Operator Precedence

logical operator precedence

an SQL rule stating that in the execution of the query, the operator AND is applied first, while the operator OR is applied second

AND > OR

regardless of the order in which you use these operators, SQL will always start by reading the conditions around the AND operator


The Three Wildcard Characters
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Wildcard Characters

wildcard characters

you would need a wildcard character whenever you wished to put *“anything”* on its place

Wildcard Characters

% - a substitute for a *sequence* of characters

LIKE ('Mar%') Mark, Martin, Margaret

_ - helps you match a *single* character

LIKE ('Mar_') Mark, Marv, Marl

Wildcard Characters

`*` will deliver a list of *all* columns in a table

```
SELECT * FROM employees;
```

- it can be used to count *all* rows of a table


BETWEEN... AND...

BETWEEN… AND…

BETWEEN… AND…

helps us designate the interval to which a given value belongs

BETWEEN… AND…


```sql
SELECT
    *
FROM
    employees
WHERE
    hire_date BETWEEN '1990-01-01' AND '2000-01-01';
```

BETWEEN… AND…


```sql
SELECT
    *
FROM
    employees
WHERE
    hire_date BETWEEN '1990-01-01' AND '2000-01-01';
```

'1990-01-01' AND '2000-01-01' *will be included* in the retrieved list of records

BETWEEN... AND...

- NOT BETWEEN... AND...

BETWEEN… AND…

- **NOT BETWEEN… AND…**

  will refer to an interval composed of two parts:

BETWEEN… AND…

NOT BETWEEN… AND…

will refer to an interval composed of two parts:

- an interval below the first value indicated

BETWEEN… AND…

NOT BETWEEN… AND…

will refer to an interval composed of two parts:

- an interval below the first value indicated
- a second interval above the second value

BETWEEN… AND…


```sql
SELECT
    *
FROM
    employees
WHERE
    hire_date NOT BETWEEN '1990-01-01' AND '2000-01-01';
```

BETWEEN… AND…


```sql
SELECT
    *
FROM
    employees
WHERE
    hire_date NOT BETWEEN '1990-01-01' AND '2000-01-01';
```

- the hire_date is *before* '1990-01-01'

BETWEEN… AND…


```sql
SELECT
    *
FROM
    employees
WHERE
    hire_date NOT BETWEEN '1990-01-01' AND '2000-01-01';
```

- the hire_date is *before* '1990-01-01'
  or
- the hire_date is *after* '2000-01-01'

BETWEEN… AND…


```sql
SELECT
    *
FROM
    employees
WHERE
    hire_date NOT BETWEEN '1990-01-01' AND '2000-01-01';
```

'1990-01-01' AND '2000-01-01' *are not included* in the intervals

BETWEEN… AND…

BETWEEN… AND…

BETWEEN… AND…

BETWEEN… AND…

- not used only for date values

BETWEEN… AND…

BETWEEN… AND…

- not used only for date values
- could also be applied to strings and numbers


IS NOT NULL / IS NULL

IS NOT NULL / IS NULL

- IS NOT NULL

IS NOT NULL / IS NULL

IS NOT NULL

used to extract values that are not null

IS NOT NULL / IS NULL

IS NOT NULL

used to extract values that are not null


```
SELECT column_1, column_2,… column_n
FROM table_name
WHERE column_name IS NOT NULL;
```

IS NOT NULL / IS NULL

IS NULL

used to extract values that are null


```sql
SELECT column_1, column_2,… column_n
FROM table_name
WHERE column_name IS NULL;
```

Using Other Comparison Operators

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Other Comparison Operators

So far:

Other Comparison Operators

So far:

- BETWEEN… AND…
- LIKE
- NOT LIKE
- IS NOT NULL
- IS NULL

Other Comparison Operators

So far:

- BETWEEN… AND…
- LIKE
- NOT LIKE
- IS NOT NULL
- IS NULL

In this lecture:

Other Comparison Operators

So far:

- BETWEEN… AND…
- LIKE
- NOT LIKE
- IS NOT NULL
- IS NULL

In this lecture:

=, >, >=, =<, <, <>, !=

Other Comparison Operators

SQL	
=	equal to
>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to

Other Comparison Operators

SQL	"Not Equal" operators
<>, !=	not equal,≠ different from


SELECT DISTINCT
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SELECT DISTINCT

- the SELECT statement

SELECT DISTINCT

- the SELECT statement

  can retrieve rows from a designated column, given some criteria

SELECT DISTINCT

SELECT DISTINCT

selects all *distinct, different* data values

SELECT DISTINCT

SELECT DISTINCT

selects all *distinct, different* data values


```
SELECT DISTINCT column_1, column_2,… column_n
FROM table_name;
```

Introduction to Aggregate Functions

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Introduction to Aggregate Functions

aggregate functions

they are applied on *multiple rows* of *a single column* of a table and *return* an output of *a single value*

Introduction to Aggregate Functions

- `COUNT()`

Introduction to Aggregate Functions

`COUNT()`

counts the number of non-null records in a field

Introduction to Aggregate Functions

- `COUNT()`

  counts the number of non-null records in a field

- `SUM()`

Introduction to Aggregate Functions

- `COUNT()`

  counts the number of non-null records in a field

- `SUM()`

  sums all the non-null values in a column

Introduction to Aggregate Functions

- `COUNT()`

  counts the number of non-null records in a field

- `SUM()`

  sums all the non-null values in a column

- `MIN()`

Introduction to Aggregate Functions

- **COUNT()**
  counts the number of non-null records in a field
- **SUM()**
  sums all the non-null values in a column
- **MIN()**
  returns the minimum value from the entire list

Introduction to Aggregate Functions

- **COUNT()**

  counts the number of non-null records in a field

- **SUM()**

  sums all the non-null values in a column

- **MIN()**

  returns the minimum value from the entire list

- **MAX()**

Introduction to Aggregate Functions

- **COUNT()**
  counts the number of non-null records in a field
- **SUM()**
  sums all the non-null values in a column
- **MIN()**
  returns the minimum value from the entire list
- **MAX()**
  returns the maximum value from the entire list

Introduction to Aggregate Functions

- `COUNT()`
  counts the number of non-null records in a field
- `SUM()`
  sums all the non-null values in a column
- `MIN()`
  returns the minimum value from the entire list
- `MAX()`
  returns the maximum value from the entire list
- `AVG()`

Introduction to Aggregate Functions

- **COUNT()**
  counts the number of non-null records in a field
- **SUM()**
  sums all the non-null values in a column
- **MIN()**
  returns the minimum value from the entire list
- **MAX()**
  returns the maximum value from the entire list
- **AVG()**
  calculates the average of all non-null values belonging to a certain column of a table

Introduction to Aggregate Functions

`COUNT()`

counts the number of non-null records in a field

Introduction to Aggregate Functions

COUNT()

counts the number of non-null records in a field

- it is frequently used in combination with the reserved word “DISTINCT”

Introduction to Aggregate Functions

COUNT()


```
SELECT COUNT(column_name)
FROM table_name;
```

Introduction to Aggregate Functions

COUNT()


```
SELECT COUNT(column_name)
FROM table_name;
```

the parentheses after COUNT() must start right after the keyword, not after a whitespace

Introduction to Aggregate Functions

COUNT(DISTINCT)


```
SELECT COUNT(DISTINCT column_name)
FROM table_name;
```

Introduction to Aggregate Functions

aggregate functions

they are applied on *multiple rows* of *a single column* of a table and *return* an output of *a single value*

- they ignore NULL values unless told not to


GROUP BY
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GROUP BY

When working in SQL, results can be grouped according to a specific field or fields

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- GROUP BY must be placed immediately after the WHERE conditions, if any, and just before the ORDER BY clause

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GROUP BY

When working in SQL, results can be grouped according to a specific field or fields

- GROUP BY must be placed immediately after the WHERE conditions, if any, and just before the ORDER BY clause

- GROUP BY is one of the most powerful and useful tools in SQL

GROUP BY

GROUP BY


```
SELECT column_name(s)
FROM table_name
WHERE conditions
GROUP BY column_name(s)
ORDER BY column_name(s);
```

GROUP BY

GROUP BY

in most cases, when you need an aggregate function, you must add a GROUP BY clause in your query, too

Always include the field you have grouped your results by in the SELECT statement!


HAVING
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HAVING

HAVING

HAVING

HAVING

- frequently implemented with GROUP BY

HAVING

HAVING

refines the output from records that do not satisfy a certain condition

- frequently implemented with GROUP BY

HAVING


```
SELECT column_name(s)
FROM table_name
WHERE conditions
GROUP BY column_name(s)
HAVING conditions
ORDER BY column_name(s);
```

HAVING


```sql
SELECT column_name(s)
FROM table_name
WHERE conditions
GROUP BY column_name(s)
HAVING conditions
ORDER BY column_name(s);
```

- HAVING is like WHERE but applied to the GROUP BY block

HAVING

WHERE vs. HAVING

after HAVING, you can have a condition with an aggregate function,

while WHERE cannot use aggregate functions within its conditions


WHERE vs HAVING
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WHERE vs HAVING

WHERE

WHERE vs HAVING

WHERE

allows us to set conditions that refer to subsets of *individual* rows

WHERE vs HAVING

WHERE

allows us to set conditions that refer to subsets of *individual* rows

applied *before* re-organizing the output into groups

WHERE vs HAVING

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

WHERE vs HAVING

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

WHERE

WHERE vs HAVING

WHERE

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
6	6/6/2017	2	B_1
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

re-organizing the output into groups

(GROUP BY)

WHERE vs HAVING

WHERE

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
6	6/6/2017	2	B_1
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

re-organizing the output into groups

(GROUP BY)

the output can be further improved, or *filtered*

WHERE vs HAVING

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

WHERE

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
6	6/6/2017	2	B_1
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

re-organizing the output into groups

(GROUP BY)

HAVING

WHERE vs HAVING

WHERE

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
6	6/6/2017	2	B_1
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

re-organizing the output into groups

(GROUP BY)

HAVING

1	9/3/2016	1	A_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
6	6/6/2017	2	B_1
10	8/11/2017	2	B_1

WHERE vs HAVING

WHERE

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
5	5/25/2017	4	B_2
6	6/6/2017	2	B_1
7	6/10/2017	4	A_2
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

1	9/3/2016	1	A_1
2	12/2/2016	2	C_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
6	6/6/2017	2	B_1
8	6/10/2017	3	C_1
9	7/20/2017	1	A_1
10	8/11/2017	2	B_1

re-organizing the output into groups

(GROUP BY)

HAVING

1	9/3/2016	1	A_1
3	4/15/2017	3	D_1
4	5/24/2017	1	B_2
6	6/6/2017	2	B_1
10	8/11/2017	2	B_1

ORDER BY…

WHERE vs HAVING

HAVING

- you *cannot* have both an aggregated and a non-aggregated condition in the HAVING clause

WHERE vs HAVING

Aggregate functions – GROUP BY and HAVING

WHERE vs HAVING

Aggregate functions – GROUP BY and HAVING

General conditions - WHERE

WHERE vs HAVING


```sql
SELECT column_name(s)
FROM table_name
WHERE conditions
GROUP BY column_name(s)
HAVING conditions
ORDER BY column_name(s);
```


LIMIT
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LIMIT


```sql
SELECT column_name(s)
FROM table_name
WHERE conditions
GROUP BY column_name(s)
HAVING conditions
ORDER BY column_name(s)
LIMIT number ;
```