

Introduction to Writing Queries in SQL

CSC365
Spring 2019

Listing Relations, Viewing Schema

SHOW DATABASES;

USE test;

SHOW TABLES;

DESCRIBE Movies;

SHOW CREATE TABLE Movies;

- Movies(mid, title, year, gross, duration, color, language, director, imdb)
- Genre(mid, genre)
- Stars(name, birthdate)
- StarsIn(sname, mid)

SELECT, FROM, WHERE

- Movies(mid, title, year, gross, duration, color, language, director, imdb)
- Genre(mid, genre)
- StarsIn(sname, mid)

SELECT *

FROM Movies

WHERE director = 'Steven Spielberg' AND year = 2016;

SELECT, FROM, WHERE

SELECT *

FROM Movies

WHERE director = 'Steven Spielberg' AND year = 2016;

- **FROM** clause
 - specifies the relation or relations to which query refers.
- **WHERE** clause
 - specifies a condition.
- **SELECT** clause
 - specifies which attributes of the tuples are produced as part of the answer.

SQL Queries and Relational Algebra

$\pi_L(\sigma_C(R))$

SELECT L

FROM R

WHERE C

* The operations in SQL is BAG operations, not SET operations

Projection in SQL

```
SELECT title, gross, imdb
```

```
FROM Movies
```

```
WHERE director = 'Steven Spielberg' AND year = 2016;
```

title	gross	imdb
The BFG	52792307	6.8

Projection in SQL

```
SELECT title, gross, imdb
```

```
FROM Movies
```

```
WHERE director = 'Steven Spielberg' AND year;
```

title	gross	imdb
The BFG	52792307	6.8

Bag of Tuples

1. SELECT title, language FROM Movies WHERE director = 'Steven Spielberg';
2. SELECT language FROM Movies WHERE director = 'Steven Spielberg';

title	language
Indiana Jones and the Kingdom of the Crystal Skull	English
The BFG	English
War of the Worlds	English
The Adventures of Tintin	English
Minority Report	English
A.I. Artificial Intelligence	English

language
English
English
English
English
English
English

Aliasing

SELECT title, duration as length

FROM Movies

WHERE director = 'Steven Spielberg';

title	length
Indiana Jones and the Kingdom of the Crystal Skull	122
The BFG	117
War of the Worlds	116
The Adventures of Tintin	107
Minority Report	145
A.I. Artificial Intelligence	146

Expression in SELECT clause

SELECT title, duration / 60 as lengthInHours

FROM Movies

WHERE director = 'Steven Spielberg';

title	lengthInHours
Indiana Jones and the Kingdom of the Crystal Skull	2.0333
The BFG	1.9500
War of the Worlds	1.9333
The Adventures of Tintin	1.7833
Minority Report	2.4167
A.I. Artificial Intelligence	2.4333

Expression in SELECT clause

```
SELECT title, imdb > 7.0 as is_good
```

```
FROM Movies
```

```
WHERE director = 'Steven Spielberg';
```

title	is_good
Indiana Jones and the Kingdom of the Crystal Skull	0
The BFG	0
War of the Worlds	0
The Adventures of Tintin	1
Minority Report	1
A.I. Artificial Intelligence	1

Expression in SELECT clause

SELECT 1;

+-----+
1
+-----+
1
+-----+

SELECT now();

+-----+
now()
+-----+
2019-04-22 19:12:27
+-----+

Selection in SQL

A condition in WHERE clause

SELECT title, gross, imdb

FROM Movies

WHERE director = 'Steven Spielberg' AND year <> 2016;

title	gross	imdb
Indiana Jones and the Kingdom of the Crystal Skull	317011114	6.2
War of the Worlds	234277056	6.5
The Adventures of Tintin	77564037	7.4
Minority Report	132014112	7.7
A.I. Artificial Intelligence	78616689	7.1

Comparison Operators

- =
 - Instead of ==
- <>
 - Equivalent to !=
- <, >, <=, >=

Arithmetic Operators

- +, -, *, /, %

```
[mysql> SELECT title, year, gross, imdb FROM Movies WHERE director = 'Steven Spielberg' AND year % 2 = 0;
```

title	year	gross	imdb
Indiana Jones and the Kingdom of the Crystal Skull	2008	317011114	6.2
The BFG	2016	52792307	6.8
Minority Report	2002	132014112	7.7

Logical Operators

- AND, OR
- NOT
- AND takes precedence over OR, and NOT takes precedence over both.

SELECT title, year, gross, imdb

FROM Movies

WHERE director = 'Steven Spielberg' AND NOT imdb < 7.0;

*equivalent to: director = 'Steven Spielberg' AND imdb >= 7.0

title	year	gross	imdb
The Adventures of Tintin	2011	77564037	7.4
Minority Report	2002	132014112	7.7
A.I. Artificial Intelligence	2001	78616689	7.1

Comparison of Strings

- CHAR, VARCHAR type
 - Any “pad” characters are ignored
- =, <>
- <, >, <=, >=
 - Lexicographic order
 - ‘abc’ < ‘abcd’ < ‘bcd’ < ‘bcde’

SELECT mid, title, year, gross, imdb

FROM Movies

WHERE title <= 'A';

mid	title	year	gross	imdb
61	2012	2009	166112167	5.8
86	47 Ronin	2013	38297305	6.3
262	300: Rise of an Empire	2014	106369117	6.2
407	102 Dalmatians	2000	66941559	4.8

Pattern Matching

s LIKE p

- s : string
- p : a pattern
 - % - matches 0 or more characters
 - _ - matches one character

SELECT title

FROM Movies

WHERE title LIKE 'Star%';

title
Star Trek Into Darkness
Star Trek Beyond
Star Trek
Star Wars: Episode III – Revenge of the Sith
Star Wars: Episode II – Attack of the Clones
Star Wars: Episode I – The Phantom Menace
Starship Troopers

Pattern Matching

s LIKE p

- s : string
- p : a pattern
 - % - matches 0 or more characters
 - _ - matches one character

SELECT title

FROM Movies

WHERE title LIKE 'Star _____';

+-----+
title
+-----+
Star Trek
+-----+

Pattern Matching

Escaping '

To use ' in a pattern, use " (two single quotes).

SELECT title

FROM Movies

WHERE title LIKE '%"s%';

title
Pirates of the Caribbean: At World's End
Pirates of the Caribbean: Dead Man's Chest
The Sorcerer's Apprentice
Madagascar 3: Europe's Most Wanted
Harry Potter and the Sorcerer's Stone
Charlie's Angels: Full Throttle
The Huntsman: Winter's War
Dante's Peak
Ocean's Twelve
Gulliver's Travels
Ender's Game
The Emperor's New Groove
Surf's Up
Charlie's Angels
The Devil's Own
Ocean's Eleven
It's Complicated
Ocean's Thirteen
Charlotte's Web
Something's Gotta Give

Pattern Matching

Use \ to escape special characters such as %, _, ' in MySQL.

SELECT title

FROM Movies

WHERE title LIKE '%\'%';

title
Pirates of the Caribbean: At World's End
Pirates of the Caribbean: Dead Man's Chest
The Sorcerer's Apprentice
Madagascar 3: Europe's Most Wanted
Harry Potter and the Sorcerer's Stone
Charlie's Angels: Full Throttle
The Huntsman: Winter's War
Dante's Peak
Ocean's Twelve
Gulliver's Travels
Ender's Game
The Emperor's New Groove
Surf's Up
Charlie's Angels
The Devil's Own
Ocean's Eleven
It's Complicated
Ocean's Thirteen
Charlotte's Web
Something's Gotta Give

Dates and Times in SQL

- Option 1: Use string literals in a recognized format
 - ANSI: 'YYYY-MM-DD HH:MM:SS'
 - [ISO 8601](#) date format allows you to specify time zone (ie. '2017-10-05T17:47:17Z')
 - RDBMSs often have other default string representations of dates (typically, the default is configurable, so it's dangerous to rely on this!)
- Option 2: Use vendor-specific date functions
 - MySQL
 - [MAKEDATE\(<year>, <day of year>\)](#)
 - [STR_TO_DATE\(<string>, <format>\)](#) (format is C-style: %m, %d, %Y, etc.)

Dates and Times

A date value (literal or a table/column reference) may be used along with [MySQL date functions](#) to represent expressions such as: "within the last week", "last year", "how many days since ...?", etc.

```
SELECT DATE_ADD(DateEnrolled, INTERVAL 4 YEAR) AS TargetGradDate
FROM Student;
```

```
SELECT name, birthdate, DATEDIFF(CURRENT_TIMESTAMP, birthdate) / 365 AS YearsOld
FROM Stars
WHERE birthdate is not NULL;
```

Due to the use of vendor-specific functions, these two SQL statements are *MySQL-specific*, not ANSI SQL!

Dates and Times

Revising examples:

```
SELECT *  
FROM Stars  
WHERE birthdate = '2017-10-05';
```

```
SELECT *  
FROM Stars  
WHERE birthdate <= STR_TO_DATE('9/1/2017', '%m/%d/%Y');
```

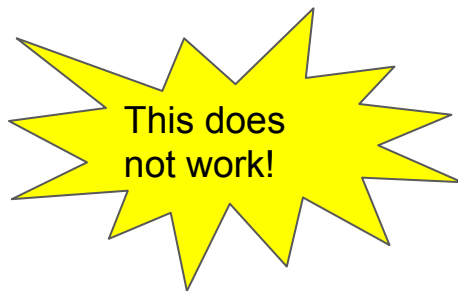
```
SELECT *  
FROM Stars  
WHERE birthdate >= DATE_SUB(CURRENT_DATE, INTERVAL 4 MONTH); -- within the last 4 months
```

Comparisons Involving NULL

SELECT *

FROM Movies

WHERE director = NULL;



SELECT *

FROM Movies

WHERE director is NULL;

SELECT * FROM Movies WHERE director is not NULL;

Comparisons Involving NULL

- The result of arithmetic operation with NULL will be NULL.
- The result of comparison with NULL will be UNKNOWN, which is NULL in MySQL.

The Truth-Value UNKNOWN

- TRUE
 - 1
 - FALSE
 - 0
 - UNKNOWN
 - NULL
-
- $\text{TRUE} > \text{UNKNOWN} > \text{FALSE}$
 - AND
 - Minimum of two truth-value
 - OR
 - Maximum of two truth-value

Ordering (Sorting) the Output

ORDER BY column_name
[ASC|DESC], ...

SELECT title, year

FROM Movies

WHERE director = 'Steven Spielberg'

ORDER BY title, year;

title	year
A.I. Artificial Intelligence	2001
Indiana Jones and the Kingdom of the Crystal Skull	2008
Minority Report	2002
The Adventures of Tintin	2011
The BFG	2016
War of the Worlds	2005

Ordering (Sorting) the Output

ORDER BY column_name

[ASC|DESC], ...

SELECT title, year

FROM Movies

WHERE director = 'Steven Spielberg'

ORDER BY year, title;

title	year
A.I. Artificial Intelligence	2001
Minority Report	2002
War of the Worlds	2005
Indiana Jones and the Kingdom of the Crystal Skull	2008
The Adventures of Tintin	2011
The BFG	2016

Practice Writing Queries in SQL