Course Chapter Map

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Learning Objectives

- Delete and modify table data
- Use the **INSERT** and **REPLACE** statements to add new data to a table
- Use the **UPDATE** statement to modify data in a table
- Use the **DELETE** statement to remove table rows

Functions in MySQL Expressions

- Several categories of functions
- Invoked within an expression
- General function syntax

```
function_name(<arg1> [, <arg2>, …, <argn>])
```

- Examples

```
SELECT NOW()

SELECT VERSION()
```

Function Tips

- **Functions can be used anywhere a value expression is accepted**
- **Columns can be used as arguments with the correct data type**
- **A function output can be the input of another function**
- **An expression with NULL always produces a NULL**
- **Mathematical functions will return NULL on error (i.e., division by zero)**

String Functions

- Perform operations on strings
- Two categories
  - Returning numbers
  - Returning strings

Returning Numbers

- Examples

```
mysql> SELECT CHAR_LENGTH('MySQL');
+----------------------+
| CHAR_LENGTH('MySQL') |
+----------------------+
|                    5 |
+----------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT INSTR('MySQL', 'SQL');
+----------------------+
| INSTR('MySQL', 'SQL') |
+----------------------+
|                    3 |
+----------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT STRCMP('abc','def'),
    -> STRCMP('def','def'),
    -> STRCMP('def','abc');
+---------------------+---------------------+---------------------+
| STRCMP('abc','def') | STRCMP('def','def') | STRCMP('def','abc') |
+---------------------+---------------------+---------------------+
|                  -1 |                   0 |                   1 |
+---------------------+---------------------+---------------------+
1 row in set (0.00 sec)
```

Returning Strings (1/5)

- Examples

```
mysql> SELECT CONCAT('A', '-', 'Z');
+----------------------+
| CONCAT('A', '-', 'Z') |
+----------------------+
| A-Z                  |
+----------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT RIGHT('MySQL', 3);
+------------------+
| RIGHT('MySQL', 3) |
+------------------+
| SQL              |
+------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT REVERSE('MySQL');
+-----------------+
| REVERSE('MySQL') |
+-----------------+
| LQSyM           |
+-----------------+
1 row in set (0.01 sec)
```

```
mysql> SELECT LEFT('MySQL', 3);
+-----------------+
| LEFT ('MySQL', 3) |
+-----------------+
| MyS             |
+-----------------+
1 row in set (0.00 sec)
```

Returning Strings (2/5)

- Examples *(continued)*

```
mysql> SELECT LOWER('MySQL');
+----------------+
| LOWER('MySQL') |
+----------------+
| mysql          |
+----------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT UPPER('MySQL');
+----------------+
| UPPER('MySQL') |
+----------------+
| MYSQL          |
+----------------+
1 row in set (0.01 sec)
```

```
mysql> SELECT LPAD('MySQL', 15, '.');
+-----------------------+
| LPAD('MySQL', 15, '.') |
+-----------------------+
| .........MySQL        |
+-----------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT RPAD('MySQL', 14,
    '_.');
+-----------------------+
| RPAD('MySQL', 14, '_.') |
+-----------------------+
| MySQL_._._._._        |
+-----------------------+
1 row in set (0.00 sec)
```

Returning Strings (3/5)

- Examples *(continued)*

```
mysql> SELECT TRIM('   MySQL    ') AS str;
+-------+
| str   |
+-------+
| MySQL |
+-------+
1 row in set (0.00 sec)


mysql> SELECT TRIM(LEADING 'Q' FROM 'QQQMySQLQQQ');
+---------------------------------------+
| TRIM(LEADING 'Q' FROM 'QQQMySQLQQQ') |
+---------------------------------------+
| MySQLQQQ                              |
+---------------------------------------+
1 row in set (0.00 sec)
```

Returning Strings (4/5)

- Examples *(continued)*

```
mysql> SELECT SUBSTRING('MySQL', 3);
+-----------------------+
| SUBSTRING('MySQL', 3) |
+-----------------------+
| SQL                   |
+-----------------------+
1 row in set (0.00 sec)


mysql> SELECT SUBSTRING('MySQL', 2, 2);
+--------------------------+
| SUBSTRING('MySQL', 2, 2) |
+--------------------------+
| yS                       |
+--------------------------+
1 row in set (0.00 sec)
```

Returning Strings (5/5)

- Examples *(continued)*

```
mysql> SELECT SUBSTRING_INDEX('training@mysql.com', '@', 1);
+-----------------------------------------------+
| SUBSTRING_INDEX('training@mysql.com', '@', 1) |
+-----------------------------------------------+
| training                                      |
+-----------------------------------------------+
1 row in set (0.00 sec)


mysql> SELECT SUBSTRING_INDEX('www.mysql.com', '.', -2);
+-------------------------------------------+
| SUBSTRING_INDEX('www.mysql.com', '.', -2) |
+-------------------------------------------+
| mysql.com                                 |
+-------------------------------------------+
1 row in set (0.00 sec)
```

Temporal Functions

- Time and date
- Several forms of description
- Generated in many ways
  - Copying existing
  - Execute built-in function
  - Build a string representation
- Date components

Type:	Default Format:
DATE	YYYY-MM-DD
TIME	HH:MM:SS
DATETIME	YYYY-MM-DD HH:MI:SS
TIMESTAMP	YYYY-MM-DD HH:MI:SS
YEAR	YYYY

Temporal Function Types

- NOW()
- CURDATE()
- CURTIME()
- YEAR(<*date_expression*>)
- MONTH(<*date_expression*>)
- DAYOFMONTH(<*date_expression*>), DAY(<*date_expression*>)
- DAYNAME(<*date_expression*>)
- HOUR(<*time_expression*>)
- MINUTE(<*time_expression*>)
- SECOND(<*time_expression*>)

Extracting Temporal Data (1/2)

- Examples

```
mysql> SELECT CURDATE(), CURTIME(), DAYNAME(NOW());
+------------+-----------+----------------+
| CURDATE()  | CURTIME() | DAYNAME(NOW()) |
+------------+-----------+----------------+
| 2006-06-09 | 17:55:40  | Friday         |
+------------+-----------+----------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT NOW(), NOW() + INTERVAL 5 DAY;
+---------------------+-----------------------+
| NOW()               | NOW() + INTERVAL 5 DAY |
+---------------------+-----------------------+
| 2006-06-09 18:02:35 | 2006-06-14 18:02:35    |
+---------------------+-----------------------+
1 row in set (0.00 sec)
```

Extracting Temporal Data (2/2)

- Examples

```
mysql> SELECT NOW(), DATE_FORMAT(NOW(), '%W the %D of %M');
+---------------------+----------------------------------------+
| NOW()               | DATE_FORMAT(NOW(), '%W the %D of %M') |
+---------------------+----------------------------------------+
| 2004-04-30 11:59:15 | Friday the 30th of April               |
+---------------------+----------------------------------------+
1 row in set (0.00 sec)
```

Numeric Functions (1/2)

- Mathematical operations
- Examples

```
mysql> SELECT ABS(-42), ABS(42);
+----------+---------+
| ABS(-42) | ABS(42) |
+----------+---------+
|       42 |      42 |
+----------+---------+
1 row in set (0.00 sec)
```

```
mysql> SELECT SIGN(-42), SIGN(-1), SIGN(0), SIGN(1), SIGN(42);
+-----------+----------+---------+---------+----------+
| SIGN(-42) | SIGN(-1) | SIGN(0) | SIGN(1) | SIGN(42) |
+-----------+----------+---------+---------+----------+
|        -1 |       -1 |       0 |       1 |        1 |
+-----------+----------+---------+---------+----------+
1 row in set (0.06 sec)
```

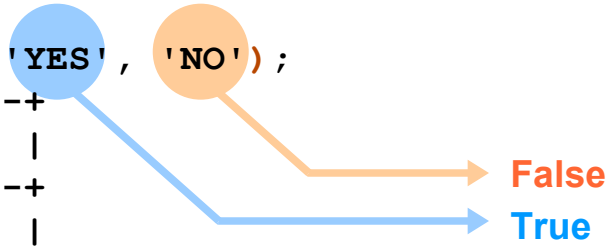
Numeric Functions (2/2)

- More numeric functions
  - **TRUNCATE(<*number*>, <*decimals*>)**
  - **FLOOR(<*number*>)**
  - **CEILING(<*number*>)**
  - **ROUND(<*number*>)**
- Mathematical functions
  - Geometry
  - Trigonometry
  - Other

Flow Control Functions (1/3)

- Choose between different values based on the result of an expression

```
mysql> SELECT IF(1 > 0, 'YES', 'NO');
+-------------------------+
| IF(1 > 0, 'YES', 'NO') |
+-------------------------+
| YES                     |
+-------------------------+
1 row in set (0.03 sec)
```



Flow Control Functions (2/3)

- **CASE/WHEN** provides branching flow control
- General syntax

```
CASE value
    WHEN <compare_value> THEN <result>
    [WHEN <compare_value> THEN <result> ...]
    [ELSE <result>]
END
```

...and...

```
CASE
    WHEN <condition> THEN <result>
    [WHEN <condition> THEN <result> ...]
    [ELSE <result>]
END
```

Flow Control Functions (3/3)

- Examples

```
mysql> SELECT CASE 3 WHEN 1 THEN 'one'
    -> WHEN 2 THEN 'two' ELSE 'more' END;
    'more'

mysql> SELECT CASE WHEN 1>0 THEN 'true' ELSE 'false' END;
    'true'

mysql> SELECT CASE BINARY 'B'
    -> WHEN 'a' THEN 1 WHEN 'b' THEN 2 END;
    NULL

SELECT pet_name, owner, pet_gender,
CASE
    WHEN pet_gender = 'm' THEN 'Boy'
    WHEN pet_gender = 'f' THEN 'Girl'
    ELSE 'Unknown'
END
FROM pet_info
ORDER BY pet_gender;
```

Why Use Aggregate Functions? (1/2)

- Summary functions
  - Perform summary operations on a set of values
- Returns Single Value Based on Group of Values
- Only **NON NULL**

Why Use Aggregate Functions? (2/2)

- Aggregate function types
  - **MIN()**
  - **MAX()**
  - **SUM()**
  - **AVG()**
  - **COUNT()**
  - **GROUP_CONCAT()**
- Examples

```
mysql> SELECT COUNT(*)
    -> FROM Country;
+----------+
| COUNT(*) |
+----------+
|      239 |
+----------+
1 row in set (0.00 sec)
```

AND

```
mysql> SELECT COUNT(Capital)
    -> FROM Country;
+----------------+
| COUNT(Capital) |
+----------------+
|            232 |
+----------------+
1 row in set (0.00 sec)
```

Grouping with SELECT...GROUP BY (1/2)

- Use **GROUP BY** for sub-group
- Based on values on one or more columns of rows
- Example

```
mysql> SELECT Continent, AVG(Population)
    -> FROM Country
    -> GROUP BY Continent;
+---------------+------------------+
| Continent     | AVG(Population)  |
+---------------+------------------+
| Asia          |   72647562.7451  |
| Europe        |   15871186.9565  |
| North America |   13053864.8649  |
| Africa        |   13525431.0345  |
| Oceania       |    1085755.3571  |
| Antarctica    |          0.0000  |
| South America |   24698571.4286  |
+---------------+------------------+
7 rows in set (0.00 sec)
```

Grouping with SELECT...GROUP BY (2/2)

- Use **GROUP_CONCAT()** to concatenate results
- Example

```
mysql> SELECT GovernmentForm, GROUP_CONCAT(Name) AS Countries
    -> FROM Country WHERE Continent = 'South America'
    -> GROUP BY GovernmentForm\G
*************************** 1. row ***************************
GovernmentForm: Dependent Territory of the UK
      Countries: Falkland Islands
*************************** 2. row ***************************
GovernmentForm: Federal Republic
      Countries: Argentina,Venezuela,Brazil
*************************** 3. row ***************************
GovernmentForm: Overseas Department of France
      Countries: French Guiana
*************************** 4. row ***************************
GovernmentForm: Republic
Countries:Chile,Uruguay,Suriname,Peru,Paraguay,Bolivia,Guyana,
Ecuador,Colombia
4 rows in set (0.00 sec)
```

GROUP BY...HAVING

- Eliminates rows based on aggregate values
- Only for comparisons against aggregated values
- Example

```
mysql> SELECT Continent, SUM(Population) AS pop
    -> FROM Country
    -> GROUP BY Continent
    -> HAVING SUM(Population) > 100000000;
+---------------+------------+
| Continent     | pop        |
+---------------+------------+
| Asia          | 3705025700 |
| Europe        |  730074600 |
| North America |  482993000 |
| Africa        |  784475000 |
| South America |  345780000 |
+---------------+------------+
5 rows in set (0.00 sec)
```

GROUP BY...WITH ROLLUP (1/2)

- Multiple levels of summary values
- Example

```
mysql> SELECT Continent, SUM(Population) AS pop
    -> FROM Country
    -> GROUP BY Continent WITH ROLLUP;
+---------------+------------+
| Continent     | pop        |
+---------------+------------+
| Asia          | 3705025700 |
| Europe        |  730074600 |
| North America |  482993000 |
| Africa        |  784475000 |
| Oceania       |   30401150 |
| Antarctica    |          0 |
| South America |  345780000 |
| NULL          | 6078749450 |
+---------------+------------+
8 rows in set (0.53 sec)
```

GROUP BY...WITH ROLLUP (2/2)

- Super aggregate operation
- Example

```
mysql> SELECT Continent, AVG(Population) AS avg_pop
    -> FROM Country
    -> GROUP BY Continent WITH ROLLUP;
+---------------+---------------+
| Continent     | avg_pop       |
+---------------+---------------+
| Asia          | 72647562.7451 |
| Europe        | 15871186.9565 |
| North America | 13053864.8649 |
| Africa        | 13525431.0345 |
| Oceania       |  1085755.3571 |
| Antarctica    |        0.0000 |
| South America | 24698571.4286 |
| NULL          | 25434098.1172 |
+---------------+---------------+
8 rows in set (0.06 sec)
```

IGNORE SPACE

- Example

```
mysql> SELECT PI ();
ERROR 1305 (42000): FUNCTION world.PI does not exist

mysql> SET sql_mode = 'IGNORE_SPACE';
Query OK, 0 rows affected (0.06 sec)

mysql> SELECT PI ();
+----------+
| PI()     |
+----------+
| 3.141593 |
+----------+
1 row in set (0.05 sec)
```

Further Practice: Chapter 9

- Comprehensive exercises

Chapter Summary

- Delete and modify table data
- Use the **INSERT** and **REPLACE** statements to add new data to a table
- Use the **UPDATE** statement to modify data in a table
- Use the **DELETE** statement to remove table rows