SQL = Structured Query Language

==

Connecting and Disconnecting from THE SERVER

==

shell> **mysql -h *host* -u *user* -p   //host can be omitted when on localhost !!!**
Enter password: ************

mysql> = mysql is ready to receive statements.
-> = prompt for multi-line statements
-> **\c** = ESCAPE CHARACTER
'> "> `> /*> = waiting for completion of a string with ' " or and indetifier with ` or a comment that began with /*

ERROR 2002 (HY000): Can't connect to local MySQL server through socket '/tmp/mysql.sock' (2)
== the SERVER daemon/windows service is not running.

Shell> mysql   //anonymous login
Then: mysql> QUIT

A QUERY consists of an SQL statement followed by a SEMICOLON **;**
In some cases, like QUIT, the semicolon can be omitted.

KEYWORDS may be entered in any lettercase.

mysql> SELECT VERSION(), CURRENT_DATE;
mysql> select version(), current_date;   //all the same!
mysql> SeLeCt vErSiOn(), current_DATE

==

2. Creating and Using a Database

==

Create: mysql> CREATE DATABASE menagerie;
Using: mysql> USE menagerie **OR**
shell> mysql -h host -u user -p menagerie

Mysql>**SHOW TABLES;**   //shows the tables in the DB
Empty set (0.00 sec)

Create Table:

Mysql> **CREATE TABLE**
(
pet (name **VARCHAR**(20) *constraint_name*,
owner VARCHAR(20),
species VARCHAR(20),
sec **CHAR**(1),
birth **DATE**,
death **DATE**
);

VARCHAR(1 - 65536)

Constraints:
rules for the data in the table, specified when the table is **created** or with **ALTER TABLE statement**.
NOT NULL - cannot store NULL value
UNIQUE - each column must have a unique value (ID has to be unique, or SN)
PRIMARY KEY - NOT NULL + UNIQUE - a column (or more) have a unique identity, making it quick and easy to find **(ID)**
FOREIGN KEY - reference to values in another table (**users**.ID and **sales**.ID)
CHECK - ensures the value meets a specific condition
DEFAULT - default value for a column

ALTER TABLE Persons   // adds a UNIQUE constraint to the **id** column
ADD UNIQUE (id);
OR
DROP CONSTRAINT (id); // ???
OR
ADD CONSTRAINT constraint_name UNIQUE (column_1, column_2) // on multiple columns

Writing a Basic SQL Statement

==

First_name OR [First Name] - with a space, or in use of a keyword like [user]!

USE MySampleDB;
SELECT product_description FROM product; // select column

SELECT ...
FROM ...
WHERE condition;

==

Restricting and Sorting Data

==

LIMIT 3; // first 3 results

LIMIT 10, 15; // results 10 to 15

SELECT **DISTINCT** .... // no duplicates

ORDER BY column_name // order by another column (0-9, a-z,...)

ORDER BY column1, column2 // order first by column1, and then column2

ORDER BY ... ASC (default)/DESC //ascending or descending order

WHERE name = 'iPhone 6S+';

Comparison Operators: =,!=,<>,>,<,<=,>=, BETWEEN x AND y (0-9, a-z)

NULL Values:

WHERE name **IS** NULL; // not with **=**

Advanced:

AND, OR, NOT, IN

AND > OR // precedence, no matter the order of writing

WHERE price **IN (49, 100, 999)**; // range of criteria

Wildcards:

_ - any ONE character
% - any number of characters

... WHERE name LIKE 'b%';
'%fy';   // ending with -fy
'%w%'; //w in the middle
'_____' // any five characters!!!
'se_en' // seven, se7en...

... WHERE year BETWEEN 1990 AND 2000;
name BETWEEN 'B' AND 'M';   // names starting with B through M

Regular Expressions(Advanced Searching):
- More flexible!
- **Character Matching:**

SELECT ... WHERE prod_name REGEXP 'Gr**.**y Computer Case';
. - single character wildcard
WHERE prod_name REGEXP 'Gr[**ae**]y Computer Case';
[xy] - **group** of characters
WHERE prod_name REGEXP 'Model [**1-6**]543';
[a-z] - **range** of characters
WHERE prod_name REGEXP 'Model \\[7543\\]';
\\ - **escape** characters
\\n - new line; \\f - form feed; \\t - tab
\\r - carriage return; \\v - vertical tab
WHERE prod_name REGEXP 'One[[**:digit:**]]One';
[[:digit:]] - class digit; **alpha** - any letter (upper, lower); **blank** - space/tab
graph - any char without space; **lower/upper; punct; space; xdigit** - hex

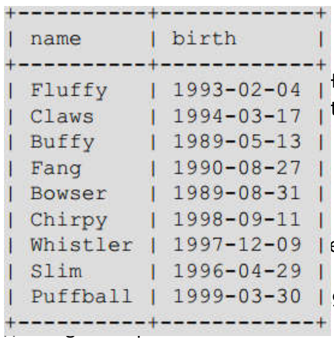
WHERE prod_name REGEXP '[[:digit:]]**{3}**';
WHERE prod_name REGEXP 'Drives**?**'; // **s** - optional (**useful for plurals**)
*****- any number of matches; **+** - one or more; **{n}** - n matches; **{n,}** - NOT less than n matches; **{n1, n2}** - between n1 and n2 matches; **?** - optional single char. Match.

DROP CONSTRAINT (id); // ???
OR
ADD CONSTRAINT constraint_name UNIQUE (column_1, column_2) // on multiple columns

Mysql> **DESCRIBE** pet; //in case we forgot the names of our columns.(visualises table)

Populating a table:
You can save a .txt file with ONE record per line, with values separated by TABS and in the given order. For unknown values we can use NULL as \N
mysql> LOAD DATA LOCAL INFILE '/path/pet.txt' INTO TABLE pet;

Mysql> **INSERT INTO** pets
-> **VALUES** ('Puffball', 'Diane', 'hamster', 'f', '1999-03-30', NULL);



```
+----------+------------+
| name     | birth      |
+----------+------------+
| Fluffy   | 1993-02-04 |
| Claws    | 1994-03-17 |
| Buffy    | 1989-05-13 |
| Fang     | 1990-08-27 |
| Bowser   | 1989-08-31 |
| Chirpy   | 1998-09-11 |
| Whistler | 1997-12-09 |
| Slim     | 1996-04-29 |
| Puffball | 1999-03-30 |
+----------+------------+
```

ERE conditions;
ta

it

et.txt' INTO TABLE pet;

9-08-31' WHERE name = 'Bowser'

Selecting Particular Rows:
To verify the change to bowser's record:
Mysql> SELECT * FROM pet WHERE name = 'Bowser';

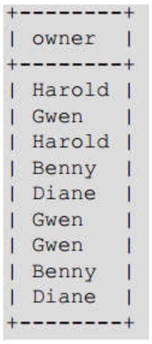
String comparisons are case **IN**sensitive !

Mysql> SELECT * FROM pet WHERE birth **>=** '1998-1-1';
//born after 1998
Mysql> SELECT * FROM pet WHERE species = 'dog' **AND** sex = 'f'; // female dogs
species = 'snake' **OR** species = 'bird';
//snake or bird

(species = 'cat' AND sex ='m') OR
(species='dog' AND sex = 'f'); // AND > OR

Selecting Particular Columns:
If you don't want to see entire rows from your table, just name the columns.

Mysql> **SELECT name, birth FROM pet**; mysql> **SELECT owner FROM pet**;



```
+--------+
| owner  |
+--------+
| Harold |
| Gwen   |
| Harold |
| Benny  |
| Diane  |
| Gwen   |
| Gwen   |
| Benny  |
| Diane  |
+--------+
```

mysql>**SELECT DISTINCT owner FROM pet;** //only UNIQUE entries = Benny, Diane, Gwen, Harold

Combine Row and Column Selection:
Mysql> SELECT name, species, birth FROM pet
WHERE species = 'dog' OR species = 'cat';

Sorting Rows:

*****- any number of matches; **+** - one or more; **{n}** - n matches; **{n,}** - NOT less than n matches; **{n1, n2}** - between n1 and n2 matches; **?** - optional single char. Match.

WHERE prod_name REGEXP '**^**[[:digit:]]';
WHERE prod_name REGEXP 'Phone**$**';
^ - start of text; **$** - end of text; **[[:<:]]** - start of word; **[[:>:]]** - end of word

==

Single Row Functions

==

Single row functions work on a single row and return one output per row.

e.g. length and case conversion.

They can be character specific, numeric, date, and conversion functions.

General: (NULL Handling) - NVL, NVL2, NULLIF, COALESCE, CASE, DECODE

Case Conversion: UPPER, LOWER, INITCAP(First_big)

Character: CHAR in CHAR out: CONCAT, LENGTH, REPLACE, SUBSTR,

TRIM,

INSTR - return numeric position of char in string

LPAD/RPAD - pad (FILL UP) the given string up to a specific length with given character (auto same MAX width ?)

REPLACE - replace character from string with a given character

Numeric: NUM in NUM out -

MOD - remainder of the division

ROUND, TRUNC - round and truncate the number

Date functions: MONTHS_BETWEEN, ADD_MONTHS, NEXT_DAY, LAST_DAY, ROUND, TRUNC

==

Aggregating Data using Group Functions

==

Group(aggregate) functions operate on sets of values and are normally used with a **GROUP BY** clause.

What is the average salary of employees in **each department**?
How many employees work in **each department**?
How many employees are working on a **particular project**?

Can be used in both SELECT and HAVING clauses.

AVG(), COUNT(*), MAX(), MIN(), SUM()

AV/COUNT/SUM([ALL | DISTINCT] expression) // ALL - default

SELECT … FROM….

GROUP BY…

HAVING price > 200;

WHERE - before grouping

HAVING - after grouping

==

Writing Subqueries

==

```
SELECT * FROM items
WHERE cost >
(
   SELECT AVG(cost) FROM items
)
ORDER BY cost DESC;
```

Mysql> SELECT name, species, birth FROM pet
WHERE species = 'dog' OR species = 'cat';

Sorting Rows:
Mysql> **SELECT name, birth FROM pet ORDER BY birth** (DESC); // default ASCENDING, DESC is optional
Mysql> **SELECT name, species, birth FROM pet**
ORDER BY species, birth DESC; // first order by species ASC, then date within species
GROUP BY price; // groups by one of the columns.

DESC applies only to the keyword immediately preceding it!

Date Calculations:
Mysql> SELECT name, birth, CURDATE(),
TIMESTAMPDIFF(YEAR, birth, CURDATE()) AS age //difference in YEARS btw. Birth and now
FROM pet WHERE death IS NOT NULL; // only for the LIVING

NULL is a special value! So no comparison operators!

MONTH(birth) = month of birth e.g. 2 = February
DAYOFMONTH(birth) = day e.g. 3th of February

SELECT name, birth FROM pet WHERE MONTH(birth) = 5; // born in month

MONTH(DATE_ADD(CURDATE(), INTERVAL 1 MONTH)); //next month !

Working with NULL Values:

NULL = missing unknown value
Test/Comparison:
1 **IS NULL** = 0
1 IS **NOT** NULL = 1

ORDER BY ... ASC > NULL First
DESC > NULL Last
LIMIT 3; - show only the first 3 entries
LIMIT 10, 15; - show from 10 to 15

Pattern Matching:

... WHERE name LIKE 'b%';
'%fy'; // ending with -fy
'%w%'; //w in the middle
'_____' // any five characters!!!
'se_en' // seven, se7en...

... WHERE year BETWEEN 1990 AND 2000;
name BETWEEN 'B' AND 'M'; // names starting with B through M

_ - any ONE character
% - any number of characters

Numerical Functions:

SELECT SUM(price) ... // select the total sum of a numeric column e.g. sum of prices
MAX(price) ... // select the Max or Min price of the column
MIN(price) ...
AVG(price) ... // calculate the Average price of the column
ROUND

Extended Regular Expressions:

REGEXP and NOT REGEXP
'.' - any single character
[abc] - matches **a or b or c**.
[a - z] - range of characters, **[0 - 9]** - range of numbers -- matches any

(
SELECT AVG(cost) FROM items
)
ORDER BY cost DESC;

SELECT name, MIN(cost) FROM items
WHERE name LIKE '%frogs%'
AND seller_id IN // **IN(list)**
(
SELECT seller_id FROM items
WHERE name LIKE '%frogs%'
);

===

Manipulating Data - Data Manipulation Language (DML) Commands

===

https://docs.oracle.com/cd/B12037_01/server.101/b10759/statements_1001.htm#i2099257

===

Creating Tables

===

Mysql> **CREATE TABLE**
(
pet (name **VARCHAR**(20) *constraint_name*,
owner VARCHAR(20),
species VARCHAR(20),
sec **CHAR**(1),
birth **DATE**,
death **DATE**
);

VARCHAR(1 - 65536)

===

Including Constraints

===

Rules for the data in the table, specified when the table is **created** or with ALTER TABLE statement.
NOT NULL - cannot store NULL value
UNIQUE - each column must have a unique value (ID has to be unique, or SN)
PRIMARY KEY - NOT NULL + UNIQUE - a column (or more) have a unique identity, making it quick and easy to find **(ID)**
FOREIGN KEY - reference to values in another table (**users**.ID and **sales**.ID)
CHECK - ensures the value meets a specific condition
DEFAULT - default value for a column

ALTER TABLE Persons // adds a UNIQUE constraint to the **id** column
ADD UNIQUE (id);
OR
DROP CONSTRAINT (id); // ???
OR
ADD CONSTRAINT constraint_name UNIQUE (column_1, column_2) // on multiple columns

===

Creating Views

===

A view is a virtual table based on the result-set of an SQL statement.

It has rows and columns, like a table. The fields in a view are from one or more real tables in the DB.

A view always shows up-to-date data! The database engine recreates the data, using the view's SQL statement, every time a user queries a view.

(Like a shortcut)

Most commonly used with JOINS.

CREATE VIEW mostbids AS

SELECT id, name, bids FROM items ORDER BY bids DESC LIMIT 10;

REGEXP and NOT REGEXP
'.' - any single character
[abc] - matches **a or b or c**.
[a - z] - range of characters, **[0 - 9]** - range of numbers -- matches any character/any number
***** - matches zero or more instances of the thing **PRECEDING**. **'x*'** - matches any 'x' characters, **[0-9]*** - matches any number of digits, '**.***' - matches any number of anything.

REGEXP succeeds if the pattern matches **ANYWHERE** in the tested value, unlike **LIKE**, which succeeds if it matches the **ENTIRE** value.

^b - at the beginning
Fy$ - at the end

```
SELECT * FROM pet WHERE name REGEXP '^b';
                    REGEXP BINARY '^b'; // CASE SENSITIVE!!
                    REGEXP 'w';         // containing 'w'
                    REGEXP '^.....$'    // names containing
                    exactly FIVE chars.
                    REGEXP '^.{5}$'     // {n} repeat-n-times
```

Counting Rows:
COUNT(column_name) - how many rows are there in the column
SELECT owner, COUNT(*) FROM pet GROUP BY owner;   // how many pets each of them has.
COUNT(*) AS count FROM ... WHERE name LIKE 'G%'; counts the TOTAL number of name that start with a G

Using More Than One Table:

Table_name.column_name = FULLY QUALIFIED NAMES
Now we have also a 'event' table with the events occurred with our animals (name, date, type, remark)

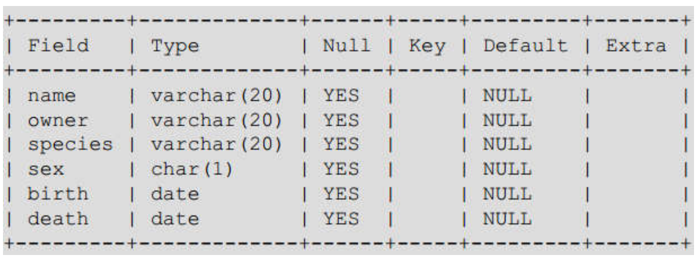
Ages of the pet when it gave birth.
```
SELECT pet.name,
   (YEAR(date)-YEAR(birth)) - (RIGHT(date, 5) <RIGHT(birth,5)) AS age,   //
 RIGHT = substring on the right, len=5
   remark
   FROM pet INNER JOIN event    // INNER JOIN = ONLY when conditions
 meets on the ON clause
   ON pet.name = event.name
   WHERE event.type = 'litter';
```

```
name | age | remark |
+---------+------+-----------------------------+
| Fluffy | 2 | 4 kittens, 3 female, 1 male |
| Buffy | 4 | 5 puppies, 2 female, 3 male |
| Buffy | 5 | 3 puppies, 3 female |
```

===
3. Getting Information About Databases and Tables
===

Forgot the name of your database or table ?

```
>SHOW DATABASES;   // DBs managed by the server
>SELECT DATABASE(); // DB currently in use
>SHOW TABLES;        // default DB's tables
>DESCRIBE table_name; // prints the structure of the table
```



```
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| name    | varchar(20) | YES  |     | NULL    |       |
| owner   | varchar(20) | YES  |     | NULL    |       |
| species | varchar(20) | YES  |     | NULL    |       |
| sex     | char(1)     | YES  |     | NULL    |       |
| birth   | date        | YES  |     | NULL    |       |
| death   | date        | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
```

KEY = indexed ?
Extra = auto_increment ?

CREATE VIEW mostbids AS

SELECT id, name, bids FROM items ORDER BY bids DESC LIMIT 10;

SELECT * FROM mostbids;

Updating/Dropping a View:

CREATE OR REPLACE VIEW name AS

SELECT old_query, NEW_QUERY

FROM table_name

WHERE condition;

DROP VIEW view_name

Joining Tables:

===

Other Database Objects

===

===

Controlling User Access

===

MySQL limits BOTH USERS and WHAT they can do.

SELECT user FROM user;   // users and their privileges

Creating Users:

CREATE 'username'@'localhost' IDENTIFIED BY 'password';

 - can only connect FROM localhost!! > **'username' @ '%' = anywhere!**

 - password will be encrypted!

Verify it:

SELECT host, user, password FROM user WHERE user = 'username';

MISC:

DROP USER 'username' @ 'localhost';

RENAME USER ...@... TO ... @ ...;

SET **PASSWORD** FOR ...@... = Password('new_password');

User Privileges:

A newly created user can log into the MySQL server, but has no privileges to do anything.

After creating a user is to GRANT privileges.

SHOW GRANTS FOR ...@...;

GRANT USAGE ON *.* TO ...@... IDENTIFIED BY ...

USAGE ON *.* = no privileges!

GRANT SELECT, INSERT on MySampleDB.* TO ...@...;

User can perform **SELECT** and **INSERT** statements on **ANY** tables in the MySampleDB.

===

SHOW CREATE TABLE = show needed
statement for the CREATE TABLE