

keyword **DISTINCT**:

```
mysql> SELECT DISTINCT owner FROM pet;
+-----+
| owner |
+-----+
| Benny |
| Diane |
| Gwen  |
| Harold|
+-----+
```

You can use a **WHERE** clause to combine row selection with column selection. For example, to get birth dates for dogs and cats only, use this query:

```
mysql> SELECT name, species, birth FROM pet
-> WHERE species = 'dog' OR species = 'cat';
+-----+-----+-----+
| name  | species | birth   |
+-----+-----+-----+
| Fluffy| cat     | 1993-02-04 |
| Claws | cat     | 1994-03-17 |
| Buffy | dog     | 1989-05-13 |
| Fang  | dog     | 1990-08-27 |
| Bowser| dog     | 1989-08-31 |
+-----+-----+-----+
```

### 3.3.4.4. Sorting Rows

You may have noticed in the preceding examples that the result rows are displayed in no particular order. It's often easier to examine query output when the rows are sorted in some meaningful way. To sort a result, use an **ORDER BY** clause.

Here are animal birthdays, sorted by date:

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

On character type columns, sorting — like all other comparison operations — is normally performed in a case-insensitive fashion. This means that the order is undefined for columns that are identical except for their case. You can force a case-sensitive sort for a column by using **BINARY** like so: **ORDER BY BINARY col\_name**.

The default sort order is ascending, with smallest values first. To sort in reverse (descending) order, add the **DESC** keyword to the name of the column you are sorting by:

```
mysql> SELECT name, birth FROM pet ORDER BY birth DESC;
+-----+-----+
| name  | birth   |
+-----+-----+
| Puffball| 1999-03-30 |
| Chirpy | 1998-09-11 |
| Whistler| 1997-12-09 |
| Slim   | 1996-04-29 |
| Claws  | 1994-03-17 |
| Fluffy | 1993-02-04 |
| Fang   | 1990-08-27 |
| Bowser | 1989-08-31 |
+-----+-----+
```

```
| Buffy | 1989-05-13 |
+-----+-----+
```

You can sort on multiple columns, and you can sort different columns in different directions. For example, to sort by type of animal in ascending order, then by birth date within animal type in descending order (youngest animals first), use the following query:

```
mysql> SELECT name, species, birth FROM pet
-> ORDER BY species, birth DESC;
+-----+-----+-----+
| name | species | birth |
+-----+-----+-----+
| Chirpy | bird | 1998-09-11 |
| Whistler | bird | 1997-12-09 |
| Claws | cat | 1994-03-17 |
| Fluffy | cat | 1993-02-04 |
| Fang | dog | 1990-08-27 |
| Bowser | dog | 1989-08-31 |
| Buffy | dog | 1989-05-13 |
| Puffball | hamster | 1999-03-30 |
| Slim | snake | 1996-04-29 |
+-----+-----+-----+
```

Note that the `DESC` keyword applies only to the column name immediately preceding it (`birth`); it does not affect the `species` column sort order.

### 3.3.4.5. Date Calculations

MySQL provides several functions that you can use to perform calculations on dates, for example, to calculate ages or extract parts of dates.

To determine how many years old each of your pets is, compute the difference in the year part of the current date and the birth date, then subtract one if the current date occurs earlier in the calendar year than the birth date. The following query shows, for each pet, the birth date, the current date, and the age in years.

```
mysql> SELECT name, birth, CURDATE(),
-> (YEAR(CURDATE())-YEAR(birth))
-> - (RIGHT(CURDATE(),5)<RIGHT(birth,5))
-> AS age
-> FROM pet;
+-----+-----+-----+-----+
| name | birth | CURDATE() | age |
+-----+-----+-----+-----+
| Fluffy | 1993-02-04 | 2003-08-19 | 10 |
| Claws | 1994-03-17 | 2003-08-19 | 9 |
| Buffy | 1989-05-13 | 2003-08-19 | 14 |
| Fang | 1990-08-27 | 2003-08-19 | 12 |
| Bowser | 1989-08-31 | 2003-08-19 | 13 |
| Chirpy | 1998-09-11 | 2003-08-19 | 4 |
| Whistler | 1997-12-09 | 2003-08-19 | 5 |
| Slim | 1996-04-29 | 2003-08-19 | 7 |
| Puffball | 1999-03-30 | 2003-08-19 | 4 |
+-----+-----+-----+-----+
```

Here, `YEAR()` pulls out the year part of a date and `RIGHT()` pulls off the rightmost five characters that represent the `MM-DD` (calendar year) part of the date. The part of the expression that compares the `MM-DD` values evaluates to 1 or 0, which adjusts the year difference down a year if `CURDATE()` occurs earlier in the year than `birth`. The full expression is somewhat ungainly, so an *alias* (`age`) is used to make the output column label more meaningful.

The query works, but the result could be scanned more easily if the rows were presented in some order. This can be done by adding an `ORDER BY name` clause to sort the output by name:

```
mysql> SELECT name, birth, CURDATE(),
-> (YEAR(CURDATE())-YEAR(birth))
-> - (RIGHT(CURDATE(),5)<RIGHT(birth,5))
-> AS age
```

```
-> FROM pet ORDER BY name;
```

name	birth	CURDATE()	age
Bowser	1989-08-31	2003-08-19	13
Buffy	1989-05-13	2003-08-19	14
Chirpy	1998-09-11	2003-08-19	4
Claws	1994-03-17	2003-08-19	9
Fang	1990-08-27	2003-08-19	12
Fluffy	1993-02-04	2003-08-19	10
Puffball	1999-03-30	2003-08-19	4
Slim	1996-04-29	2003-08-19	7
Whistler	1997-12-09	2003-08-19	5

To sort the output by `age` rather than `name`, just use a different `ORDER BY` clause:

```
mysql> SELECT name, birth, CURDATE(),
-> (YEAR(CURDATE())-YEAR(birth))
-> - (RIGHT(CURDATE(),5)<RIGHT(birth,5))
-> AS age
-> FROM pet ORDER BY age;
```

name	birth	CURDATE()	age
Chirpy	1998-09-11	2003-08-19	4
Puffball	1999-03-30	2003-08-19	4
Whistler	1997-12-09	2003-08-19	5
Slim	1996-04-29	2003-08-19	7
Claws	1994-03-17	2003-08-19	9
Fluffy	1993-02-04	2003-08-19	10
Fang	1990-08-27	2003-08-19	12
Bowser	1989-08-31	2003-08-19	13
Buffy	1989-05-13	2003-08-19	14

A similar query can be used to determine age at death for animals that have died. You determine which animals these are by checking whether the `death` value is `NULL`. Then, for those with non-`NULL` values, compute the difference between the `death` and `birth` values:

```
mysql> SELECT name, birth, death,
-> (YEAR(death)-YEAR(birth)) - (RIGHT(death,5)<RIGHT(birth,5))
-> AS age
-> FROM pet WHERE death IS NOT NULL ORDER BY age;
```

name	birth	death	age
Bowser	1989-08-31	1995-07-29	5

The query uses `death IS NOT NULL` rather than `death <> NULL` because `NULL` is a special value that cannot be compared using the usual comparison operators. This is discussed later. See [Section 3.3.4.6, “Working with NULL Values”](#).

What if you want to know which animals have birthdays next month? For this type of calculation, year and day are irrelevant; you simply want to extract the month part of the `birth` column. MySQL provides several functions for extracting parts of dates, such as `YEAR()`, `MONTH()`, and `DAYOFMONTH()`. `MONTH()` is the appropriate function here. To see how it works, run a simple query that displays the value of both `birth` and `MONTH(birth)`:

```
mysql> SELECT name, birth, MONTH(birth) FROM pet;
```

name	birth	MONTH(birth)
Fluffy	1993-02-04	2
Claws	1994-03-17	3
Buffy	1989-05-13	5
Fang	1990-08-27	8
Bowser	1989-08-31	8
Chirpy	1998-09-11	9
Whistler	1997-12-09	12
Slim	1996-04-29	4

```
| Puffball | 1999-03-30 | 3 |
+-----+-----+-----+
```

Finding animals with birthdays in the upcoming month is also simple. Suppose that the current month is April. Then the month value is 4 and you can look for animals born in May (month 5) like this:

```
mysql> SELECT name, birth FROM pet WHERE MONTH(birth) = 5;
+-----+-----+
| name | birth |
+-----+-----+
| Buffy | 1989-05-13 |
+-----+-----+
```

There is a small complication if the current month is December. You cannot merely add one to the month number (12) and look for animals born in month 13, because there is no such month. Instead, you look for animals born in January (month 1).

You can write the query so that it works no matter what the current month is, so that you do not have to use the number for a particular month. `DATE_ADD()` allows you to add a time interval to a given date. If you add a month to the value of `CURDATE()`, then extract the month part with `MONTH()`, the result produces the month in which to look for birthdays:

```
mysql> SELECT name, birth FROM pet
-> WHERE MONTH(birth) = MONTH(DATE_ADD(CURDATE(), INTERVAL 1 MONTH));
```

A different way to accomplish the same task is to add 1 to get the next month after the current one after using the modulo function (`MOD`) to wrap the month value to 0 if it is currently 12:

```
mysql> SELECT name, birth FROM pet
-> WHERE MONTH(birth) = MOD(MONTH(CURDATE()), 12) + 1;
```

Note that `MONTH` returns a number between 1 and 12. And `MOD(something, 12)` returns a number between 0 and 11. So the addition has to be after the `MOD()`, otherwise we would go from November (11) to January (1).

### 3.3.4.6. Working with NULL Values

The `NULL` value can be surprising until you get used to it. Conceptually, `NULL` means “a missing unknown value” and it is treated somewhat differently from other values. To test for `NULL`, you cannot use the arithmetic comparison operators such as `=`, `<`, or `<>`. To demonstrate this for yourself, try the following query:

```
mysql> SELECT 1 = NULL, 1 <> NULL, 1 < NULL, 1 > NULL;
+-----+-----+-----+-----+
| 1 = NULL | 1 <> NULL | 1 < NULL | 1 > NULL |
+-----+-----+-----+-----+
| NULL | NULL | NULL | NULL |
+-----+-----+-----+-----+
```

Clearly you get no meaningful results from these comparisons. Use the `IS NULL` and `IS NOT NULL` operators instead:

```
mysql> SELECT 1 IS NULL, 1 IS NOT NULL;
+-----+-----+
| 1 IS NULL | 1 IS NOT NULL |
+-----+-----+
| 0 | 1 |
+-----+-----+
```

Note that in MySQL, 0 or `NULL` means false and anything else means true. The default truth value from a boolean operation is 1.

This special treatment of `NULL` is why, in the previous section, it was necessary to determine which animals are no longer alive using `death IS NOT NULL` instead of `death <> NULL`.

Two `NULL` values are regarded as equal in a `GROUP BY`.

When doing an `ORDER BY`, `NULL` values are presented first if you do `ORDER BY ... ASC` and last if you do `ORDER BY ... DESC`.

A common error when working with `NULL` is to assume that it is not possible to insert a zero or an empty string into a column defined as `NOT NULL`, but this is not the case. These are in fact values, whereas `NULL` means “not having a value.” You can test this easily enough by using `IS [NOT] NULL` as shown:

```
mysql> SELECT 0 IS NULL, 0 IS NOT NULL, '' IS NULL, '' IS NOT NULL;
+-----+-----+-----+-----+
| 0 IS NULL | 0 IS NOT NULL | '' IS NULL | '' IS NOT NULL |
+-----+-----+-----+-----+
|          0 |              1 |           0 |                1 |
+-----+-----+-----+-----+
```

Thus it is entirely possible to insert a zero or empty string into a `NOT NULL` column, as these are in fact `NOT NULL`. See [Section A.5.3, “Problems with NULL Values”](#).

### 3.3.4.7. Pattern Matching

MySQL provides standard SQL pattern matching as well as a form of pattern matching based on extended regular expressions similar to those used by Unix utilities such as `vi`, `grep`, and `sed`.

SQL pattern matching allows you to use `'_'` to match any single character and `'%'` to match an arbitrary number of characters (including zero characters). In MySQL, SQL patterns are case-insensitive by default. Some examples are shown here. Note that you do not use `=` or `<>` when you use SQL patterns; use the `LIKE` or `NOT LIKE` comparison operators instead.

To find names beginning with `'b'`:

```
mysql> SELECT * FROM pet WHERE name LIKE 'b%';
+-----+-----+-----+-----+-----+-----+
| name   | owner  | species | sex  | birth      | death      |
+-----+-----+-----+-----+-----+-----+
| Buffy  | Harold | dog     | f    | 1989-05-13 | NULL       |
| Bowser | Diane  | dog     | m    | 1989-08-31 | 1995-07-29 |
+-----+-----+-----+-----+-----+-----+
```

To find names ending with `'fy'`:

```
mysql> SELECT * FROM pet WHERE name LIKE '%fy';
+-----+-----+-----+-----+-----+-----+
| name   | owner  | species | sex  | birth      | death      |
+-----+-----+-----+-----+-----+-----+
| Fluffy | Harold | cat     | f    | 1993-02-04 | NULL       |
| Buffy  | Harold | dog     | f    | 1989-05-13 | NULL       |
+-----+-----+-----+-----+-----+-----+
```

To find names containing a `'w'`:

```
mysql> SELECT * FROM pet WHERE name LIKE '%w%';
+-----+-----+-----+-----+-----+-----+
| name   | owner  | species | sex  | birth      | death      |
+-----+-----+-----+-----+-----+-----+
| Claws  | Gwen  | cat     | m    | 1994-03-17 | NULL       |
| Bowser | Diane | dog     | m    | 1989-08-31 | 1995-07-29 |
| Whistler | Gwen | bird    | NULL | 1997-12-09 | NULL       |
+-----+-----+-----+-----+-----+-----+
```

To find names containing exactly five characters, use five instances of the `'_'` pattern character:

```
mysql> SELECT * FROM pet WHERE name LIKE '_____';
```

name	owner	species	sex	birth	death
Claws	Gwen	cat	m	1994-03-17	NULL
Buffy	Harold	dog	f	1989-05-13	NULL

The other type of pattern matching provided by MySQL uses extended regular expressions. When you test for a match for this type of pattern, use the `REGEXP` and `NOT REGEXP` operators (or `RLIKE` and `NOT RLIKE`, which are synonyms).

Some characteristics of extended regular expressions are:

- `'.'` matches any single character.
- A character class `'[... ]'` matches any character within the brackets. For example, `'[ abc ]'` matches `'a'`, `'b'`, or `'c'`. To name a range of characters, use a dash. `'[ a-z ]'` matches any letter, whereas `'[ 0-9 ]'` matches any digit.
- `'*'` matches zero or more instances of the thing preceding it. For example, `'x*'` matches any number of `'x'` characters, `'[ 0-9 ]*'` matches any number of digits, and `'.*'` matches any number of anything.
- A `REGEXP` pattern match succeeds if the pattern matches anywhere in the value being tested. (This differs from a `LIKE` pattern match, which succeeds only if the pattern matches the entire value.)
- To anchor a pattern so that it must match the beginning or end of the value being tested, use `'^'` at the beginning or `'$'` at the end of the pattern.

To demonstrate how extended regular expressions work, the `LIKE` queries shown previously are rewritten here to use `REGEXP`.

To find names beginning with `'b'`, use `'^'` to match the beginning of the name:

```
mysql> SELECT * FROM pet WHERE name REGEXP '^b';
```

name	owner	species	sex	birth	death
Buffy	Harold	dog	f	1989-05-13	NULL
Bowser	Diane	dog	m	1989-08-31	1995-07-29

If you really want to force a `REGEXP` comparison to be case sensitive, use the `BINARY` keyword to make one of the strings a binary string. This query matches only lowercase `'b'` at the beginning of a name:

```
mysql> SELECT * FROM pet WHERE name REGEXP BINARY '^b';
```

To find names ending with `'fy'`, use `'$'` to match the end of the name:

```
mysql> SELECT * FROM pet WHERE name REGEXP 'fy$';
```

name	owner	species	sex	birth	death
Fluffy	Harold	cat	f	1993-02-04	NULL
Buffy	Harold	dog	f	1989-05-13	NULL

To find names containing a 'w', use this query:

```
mysql> SELECT * FROM pet WHERE name REGEXP 'w';
```

name	owner	species	sex	birth	death
Claws	Gwen	cat	m	1994-03-17	NULL
Bowser	Diane	dog	m	1989-08-31	1995-07-29
Whistler	Gwen	bird	NULL	1997-12-09	NULL

Because a regular expression pattern matches if it occurs anywhere in the value, it is not necessary in the previous query to put a wildcard on either side of the pattern to get it to match the entire value like it would be if you used an SQL pattern.

To find names containing exactly five characters, use '^' and '\$' to match the beginning and end of the name, and five instances of '.' in between:

```
mysql> SELECT * FROM pet WHERE name REGEXP '^.....$';
```

name	owner	species	sex	birth	death
Claws	Gwen	cat	m	1994-03-17	NULL
Buffy	Harold	dog	f	1989-05-13	NULL

You could also write the previous query using the {n} (“repeat-n-times”) operator:

```
mysql> SELECT * FROM pet WHERE name REGEXP '^.{5}$';
```

name	owner	species	sex	birth	death
Claws	Gwen	cat	m	1994-03-17	NULL
Buffy	Harold	dog	f	1989-05-13	NULL

[Appendix G, Regular Expressions](#), provides more information about the syntax for regular expressions.

### 3.3.4.8. Counting Rows

Databases are often used to answer the question, “How often does a certain type of data occur in a table?” For example, you might want to know how many pets you have, or how many pets each owner has, or you might want to perform various kinds of census operations on your animals.

Counting the total number of animals you have is the same question as “How many rows are in the `pet` table?” because there is one record per pet. `COUNT(*)` counts the number of rows, so the query to count your animals looks like this:

```
mysql> SELECT COUNT(*) FROM pet;
```

COUNT(*)
9

Earlier, you retrieved the names of the people who owned pets. You can use `COUNT()` if you want to find out how many pets each owner has:

```
mysql> SELECT owner, COUNT(*) FROM pet GROUP BY owner;
```

owner	COUNT(*)
Benny	2
Diane	2
Gwen	3
Harold	2

Note the use of `GROUP BY` to group all records for each `owner`. Without it, all you get is an error message:

```
mysql> SELECT owner, COUNT(*) FROM pet;
ERROR 1140 (42000): Mixing of GROUP columns (MIN(),MAX(),COUNT(),...)
with no GROUP columns is illegal if there is no GROUP BY clause
```

`COUNT()` and `GROUP BY` are useful for characterizing your data in various ways. The following examples show different ways to perform animal census operations.

Number of animals per species:

```
mysql> SELECT species, COUNT(*) FROM pet GROUP BY species;
```

species	COUNT(*)
bird	2
cat	2
dog	3
hamster	1
snake	1

Number of animals per sex:

```
mysql> SELECT sex, COUNT(*) FROM pet GROUP BY sex;
```

sex	COUNT(*)
NULL	1
f	4
m	4

(In this output, `NULL` indicates that the sex is unknown.)

Number of animals per combination of species and sex:

```
mysql> SELECT species, sex, COUNT(*) FROM pet GROUP BY species, sex;
```

species	sex	COUNT(*)
bird	NULL	1
bird	f	1
cat	f	1
cat	m	1
dog	f	1
dog	m	2
hamster	f	1
snake	m	1

You need not retrieve an entire table when you use `COUNT()`. For example, the previous query, when performed just on dogs and cats, looks like this:

```
mysql> SELECT species, sex, COUNT(*) FROM pet
-> WHERE species = 'dog' OR species = 'cat'
-> GROUP BY species, sex;
```

species	sex	COUNT(*)
cat	f	1
cat	m	1
dog	f	1
dog	m	2

Or, if you wanted the number of animals per sex only for animals whose sex is known:

```
mysql> SELECT species, sex, COUNT(*) FROM pet
-> WHERE sex IS NOT NULL
-> GROUP BY species, sex;
```

species	sex	COUNT(*)
bird	f	1
cat	f	1
cat	m	1
dog	f	1
dog	m	2
hamster	f	1
snake	m	1

### 3.3.4.9. Using More Than one Table

The `pet` table keeps track of which pets you have. If you want to record other information about them, such as events in their lives like visits to the vet or when litters are born, you need another table. What should this table look like? It needs:

- To contain the pet name so that you know which animal each event pertains to.
- A date so that you know when the event occurred.
- A field to describe the event.
- An event type field, if you want to be able to categorize events.

Given these considerations, the `CREATE TABLE` statement for the `event` table might look like this:

```
mysql> CREATE TABLE event (name VARCHAR(20), date DATE,
-> type VARCHAR(15), remark VARCHAR(255));
```

As with the `pet` table, it's easiest to load the initial records by creating a tab-delimited text file containing the information:

name	date	type	remark
Fluffy	1995-05-15	litter	4 kittens, 3 female, 1 male
Buffy	1993-06-23	litter	5 puppies, 2 female, 3 male
Buffy	1994-06-19	litter	3 puppies, 3 female
Chirpy	1999-03-21	vet	needed beak straightened
Slim	1997-08-03	vet	broken rib
Bowser	1991-10-12	kennel	
Fang	1991-10-12	kennel	
Fang	1998-08-28	birthday	Gave him a new chew toy
Claws	1998-03-17	birthday	Gave him a new flea collar
Whistler	1998-12-09	birthday	First birthday

Load the records like this:

```
mysql> LOAD DATA LOCAL INFILE 'event.txt' INTO TABLE event;
```

Based on what you have learned from the queries that you have run on the `pet` table, you should be able to perform retrievals on the records in the `event` table; the principles are the same. But when is the `event` table by itself insufficient to answer questions you might ask?

Suppose that you want to find out the ages at which each pet had its litters. We saw earlier how to calculate ages from two dates. The litter date of the mother is in the `event` table, but to calculate her age on that date you need her birth date, which is stored in the `pet` table. This means the query requires both tables:

```
mysql> SELECT pet.name,
-> (YEAR(date)-YEAR(birth)) - (RIGHT(date,5)<RIGHT(birth,5)) AS age,
-> remark
-> FROM pet INNER JOIN event
-> 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

There are several things to note about this query:

- The `FROM` clause joins two tables because the query needs to pull information from both of them.
- When combining (joining) information from multiple tables, you need to specify how records in one table can be matched to records in the other. This is easy because they both have a `name` column. The query uses `WHERE` clause to match up records in the two tables based on the `name` values.

The query uses an `INNER JOIN` to combine the tables. An `INNER JOIN` allows for rows from either table to appear in the result if and only if both tables meet the conditions specified in the `ON` clause. In this example, the `ON` clause specifies that the `name` column in the `pet` table must match the `name` column in the `event` table. If a name appears in one table but not the other, the row will not appear in the result because the condition in the `ON` clause fails.

- Because the `name` column occurs in both tables, you must be specific about which table you mean when referring to the column. This is done by prepending the table name to the column name.

You need not have two different tables to perform a join. Sometimes it is useful to join a table to itself, if you want to compare records in a table to other records in that same table. For example, to find breeding pairs among your pets, you can join the `pet` table with itself to produce candidate pairs of males and females of like species:

```
mysql> SELECT p1.name, p1.sex, p2.name, p2.sex, p1.species
-> FROM pet AS p1 INNER JOIN pet AS p2
-> ON p1.species = p2.species AND p1.sex = 'f' AND p2.sex = 'm';
```

name	sex	name	sex	species
Fluffy	f	Claws	m	cat
Buffy	f	Fang	m	dog
Buffy	f	Bowser	m	dog

In this query, we specify aliases for the table name to refer to the columns and keep straight which instance of the table each column reference is associated with.

## 3.4. Getting Information About Databases and Tables

What if you forget the name of a database or table, or what the structure of a given table is (for example, what its columns are called)? MySQL addresses this problem through several statements that provide information about the databases and tables it supports.

You have previously seen `SHOW DATABASES`, which lists the databases managed by the server. To find out which database is currently selected, use the `DATABASE ()` function:

```
mysql> SELECT DATABASE();
+-----+
| DATABASE() |
+-----+
| menagerie  |
+-----+
```

If you have not yet selected any database, the result is `NULL`.

To find out what tables the default database contains (for example, when you are not sure about the name of a table), use this command:

```
mysql> SHOW TABLES;
+-----+
| Tables in menagerie |
+-----+
| event               |
| pet                 |
+-----+
```

If you want to find out about the structure of a table, the `DESCRIBE` command is useful; it displays information about each of a table's columns:

```
mysql> DESCRIBE pet;
+-----+-----+-----+-----+-----+-----+
| 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    |       |
+-----+-----+-----+-----+-----+-----+
```

`Field` indicates the column name, `Type` is the data type for the column, `NULL` indicates whether the column can contain `NULL` values, `Key` indicates whether the column is indexed, and `Default` specifies the column's default value.

If you have indexes on a table, `SHOW INDEX FROM tbl_name` produces information about them.

## 3.5. Using `mysql` in Batch Mode

In the previous sections, you used `mysql` interactively to enter queries and view the results. You can also run `mysql` in batch mode. To do this, put the commands you want to run in a file, then tell `mysql` to read its input from the file:

```
shell> mysql < batch-file
```

If you are running `mysql` under Windows and have some special characters in the file that cause problems, you can do this:

```
C:\> mysql -e "source batch-file"
```

If you need to specify connection parameters on the command line, the command might look like this:

```
shell> mysql -h host -u user -p < batch-file
Enter password: *****
```

When you use `mysql` this way, you are creating a script file, then executing the script.

If you want the script to continue even if some of the statements in it produce errors, you should use the `--force` command-line option.

Why use a script? Here are a few reasons:

- If you run a query repeatedly (say, every day or every week), making it a script allows you to avoid retyping it each time you execute it.
- You can generate new queries from existing ones that are similar by copying and editing script files.
- Batch mode can also be useful while you're developing a query, particularly for multiple-line commands or multiple-statement sequences of commands. If you make a mistake, you don't have to re-type everything. Just edit your script to correct the error, then tell `mysql` to execute it again.
- If you have a query that produces a lot of output, you can run the output through a pager rather than watching it scroll off the top of your screen:

```
shell> mysql < batch-file | more
```

- You can catch the output in a file for further processing:

```
shell> mysql < batch-file > mysql.out
```

- You can distribute your script to other people so that they can also run the commands.
- Some situations do not allow for interactive use, for example, when you run a query from a `cron` job. In this case, you must use batch mode.

The default output format is different (more concise) when you run `mysql` in batch mode than when you use it interactively. For example, the output of `SELECT DISTINCT species FROM pet` looks like this when `mysql` is run interactively:

```
+-----+
| species |
+-----+
| bird   |
| cat    |
| dog    |
| hamster|
| snake  |
+-----+
```

In batch mode, the output looks like this instead:

```
species
bird
cat
dog
hamster
snake
```

If you want to get the interactive output format in batch mode, use `mysql -t`. To echo to the output the commands that are executed, use `mysql -vvv`.

You can also use scripts from the `mysql` prompt by using the `source` or `\.` command:

```
mysql> source filename;
mysql> \. filename
```

## 3.6. Examples of Common Queries

Here are examples of how to solve some common problems with MySQL.

Some of the examples use the table `shop` to hold the price of each article (item number) for certain traders (dealers). Supposing that each trader has a single fixed price per article, then (`article`, `dealer`) is a primary key for the records.

Start the command-line tool `mysql` and select a database:

```
shell> mysql your-database-name
```

(In most MySQL installations, you can use the database named `test`).

You can create and populate the example table with these statements:

```
mysql> CREATE TABLE shop (
-> article INT(4) UNSIGNED ZEROFILL DEFAULT '0000' NOT NULL,
-> dealer CHAR(20) DEFAULT '' NOT NULL,
-> price DOUBLE(16,2) DEFAULT '0.00' NOT NULL,
-> PRIMARY KEY(article, dealer));
mysql> INSERT INTO shop VALUES
-> (1, 'A', 3.45), (1, 'B', 3.99), (2, 'A', 10.99), (3, 'B', 1.45),
-> (3, 'C', 1.69), (3, 'D', 1.25), (4, 'D', 19.95);
```

After issuing the statements, the table should have the following contents:

```
mysql> SELECT * FROM shop;
+-----+-----+-----+
| article | dealer | price |
+-----+-----+-----+
| 0001    | A      | 3.45  |
| 0001    | B      | 3.99  |
| 0002    | A      | 10.99 |
| 0003    | B      | 1.45  |
| 0003    | C      | 1.69  |
| 0003    | D      | 1.25  |
| 0004    | D      | 19.95 |
+-----+-----+-----+
```

### 3.6.1. The Maximum Value for a Column

“What's the highest item number?”

```
SELECT MAX(article) AS article FROM shop;
```

```
+-----+
| article |
+-----+
| 4       |
+-----+
```

### 3.6.2. The Row Holding the Maximum of a Certain Column

*Task: Find the number, dealer, and price of the most expensive article.*

This is easily done with a subquery: