

SQL Programming

Sorting Rows in the Result Table

One of the principles of a true relational database system is that there is no implicit ordering of either the columns or rows in the database tables.

The programmer should never expect to see any particular row as the first record, nor should she expect to see any particular row as the last record.

Rows of data in the base table just exist.

At least that's the theory. The behavior of many database systems is rather predictable, and although they shouldn't, many programmers still rely on their expectations.

In a previous lesson we mentioned that SQL provided CRUD (create, retrieve, update, and delete) functionality.

The practicality of using SQL to retrieve information from a database necessitates the ability to arrange the output and to be able to present the rows of the result table in some sorted order.

The ORDER BY clause is the mechanism in SQL that gives the programmer the ability to sort the rows in the result table.

The user community has requested an alphabetical listing of all of our clients.

Rephrase: Prepare a report showing the name information for each of our clients. Sort this report in ascending last_name order.

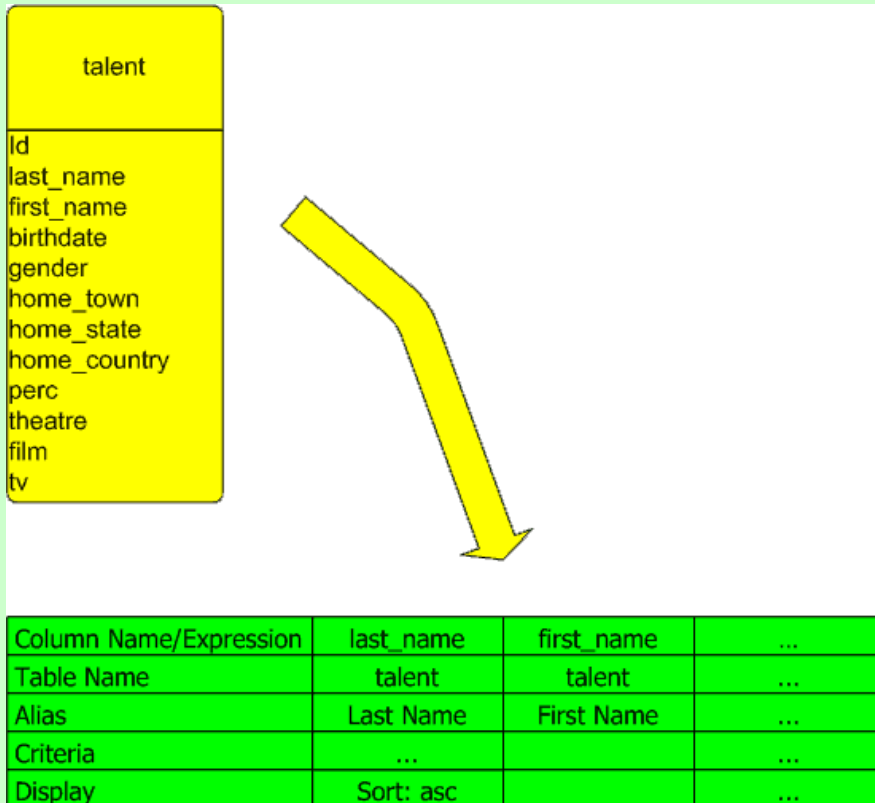
So let's put this together.

Step 1: Build the Table Build Chart (TBC)

Step 2: Double check your TBC solution

Step 3: Transform the TBC into code.

Notice how sort criteria are specified in the display row.



```
SELECT    last_name, first_name
FROM      talent
ORDER BY  last_name ASC
```

Module 07: Sorting Rows

Page B-4: Problem 8-1 Solution

Here's the solution.

iSQL*Plus Release 9.0.1 - Microsoft Internet Explorer provided by Cox High Speed Internet

File Edit View Favorites Tools Help Address cisdb02.msje.edu/isqlplus Go

Script Location: Browse... Load Script

Enter statements:

```
SELECT    last_name, first_name
FROM      talent
ORDER BY  last_name ASC
```

Execute Output: Work Screen Clear Screen Save Script

LAST_NAME	FIRST_NAME
Aniston	Jennifer
Bloom	Orlando
Brando	Marlon
Clooney	George
Costner	Kevin
Cruise	Tom
Depp	Johnny
Farrell	Colin
Ford	Harrison
Harris	Ed
Jackson	Samuel L.

Done Internet

Module 07: Sorting Rows

Page B-5: Problem 8-1 Analysis

The ORDER BY clause is the last clause in the SQL program.

If the information is to be sorted in ascending order, then the keyword ASC follows the name of the column. If the information is to be sorted in descending order, then the keyword DESC follows the column name.

Note also that there is no comma between the column name and the sorting criteria in the ORDER BY clause.

The screenshot shows the iSQL*Plus web interface in a Microsoft Internet Explorer browser. The address bar shows 'cisdb02.msje.edu/isqlplus'. The 'Script Location' field is empty, and the 'Load Script' button is visible. The 'Enter statements:' text area contains the following SQL query:

```
SELECT last_name, first_name
FROM talent
ORDER BY last_name ASC
```

Below the text area are buttons for 'Execute', 'Output' (set to 'Work Screen'), 'Clear Screen', and 'Save Script'. The 'Execute' button has been clicked, and the results are displayed in a table below.

LAST_NAME	FIRST_NAME
Aniston	Jennifer
Bloom	Orlando
Brando	Marlon
Clooney	George
Costner	Kevin
Cruise	Tom
Depp	Johnny
Farrell	Colin
Ford	Harrison
Harris	Ed
Jackson	Samuel L.

The browser status bar at the bottom shows 'Done' and 'Internet'.

The user community has requested a listing of all of our clients arranged by age, with the youngest clients appearing at the top of the list.

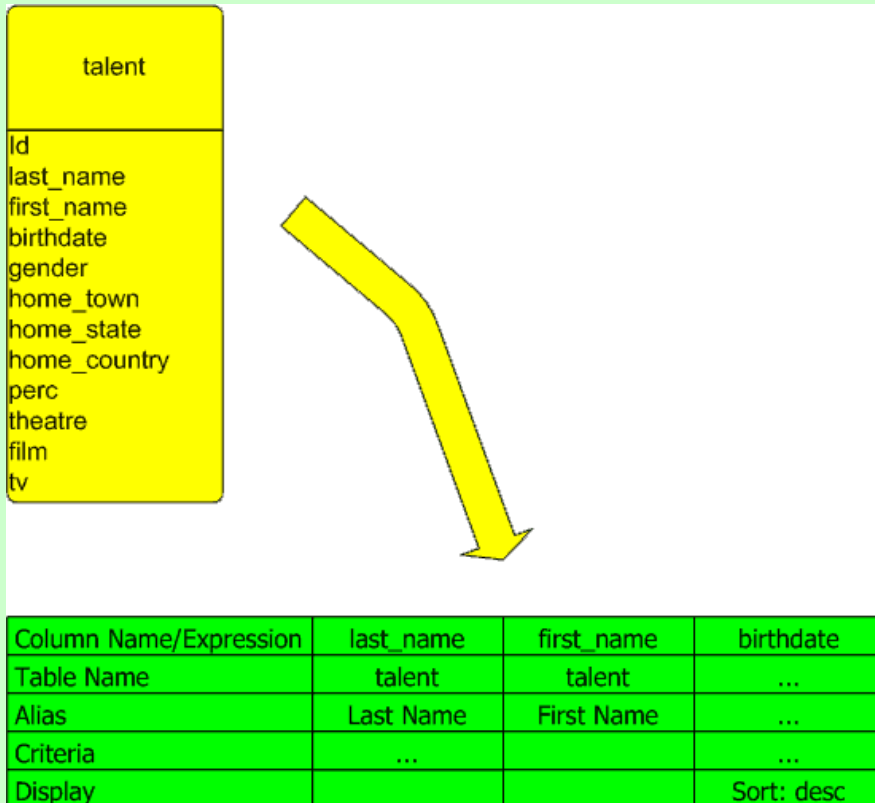
Rephrase: Prepare a report showing the name and birth date information for each of our clients. Sort this report in descending birth date order.

Step 1: Build the Table Build Chart (TBC)

Step 2: Double check your TBC solution

Step 3: Transform the TBC into code.

Notice how the sort criteria are specified in the display row.



```
SELECT    last_name, first_name, birthdate
FROM      talent
ORDER BY  birthdate DESC
```

Module 07: Sorting Rows

Page B-8: Problem 8-2 Solution

Here's the solution.



The screenshot shows the iSQL*Plus web interface in a Microsoft Internet Explorer browser. The address bar shows the URL `cisdb02.msje.edu/isqlplus`. The main text area contains the following SQL query:

```
SELECT last_name, first_name, birthdate
FROM   talent
ORDER BY birthdate DESC
```

Below the query area, there are buttons for "Execute", "Output" (with a dropdown menu set to "Work Screen"), "Clear Screen", and "Save Script".

The results are displayed in a table with the following data:

LAST_NAME	FIRST_NAME	BIRTHDATE
Bloom	Orlando	13-JAN-77
Farrell	Colin	31-MAY-76
Jolie	Angelina	04-JUN-75
Ryder	Winona	29-OCT-71
Wahlberg	Mark	05-JUN-71
Aniston	Jennifer	11-FEB-69
Roberts	Julia	28-OCT-67
Kidman	Nicole	20-JUN-67
Pitt	Brad	18-DEC-63
Depp	Johnny	09-JUN-63
Moore	Demi	11-NOV-62
Cruise	Tom	03-JUL-62
Clooney	George	06-MAY-61

Module 07: Sorting Rows

Page B-9: Problem 8-2 Analysis

The screenshot shows the iSQL*Plus web interface. The title bar indicates 'iSQL*Plus Release 9.0.1 - Microsoft Internet Explorer provided by Cox High Speed Internet'. The address bar shows 'cisdb02.msje.edu/isqlplus'. The main text area contains the following SQL query:

```
SELECT last_name, first_name, birthdate
FROM   talent
ORDER BY birthdate DESC
```

Below the query area are buttons for 'Execute', 'Output' (with a dropdown menu set to 'Work Screen'), 'Clear Screen', and 'Save Script'. The results are displayed in a table with three columns: LAST_NAME, FIRST_NAME, and BIRTHDATE. The data is sorted by birthdate in descending order.

LAST_NAME	FIRST_NAME	BIRTHDATE
Bloom	Orlando	13-JAN-77
Farrell	Colin	31-MAY-76
Jolie	Angelina	04-JUN-75
Ryder	Winona	29-OCT-71
Wahlberg	Mark	05-JUN-71
Aniston	Jennifer	11-FEB-69
Roberts	Julia	28-OCT-67
Kidman	Nicole	20-JUN-67
Pitt	Brad	18-DEC-63
Depp	Johnny	09-JUN-63
Moore	Demi	11-NOV-62
Cruise	Tom	03-JUL-62
Clooney	George	06-MAY-61

Notice that the sort on the birth date column is not an alphabetic sort. Rather the birth date column is sorted in the correct fashion, based on the date values.

This is just another example of the benefits of data types. Data types define the structure, format, and behavior of the objects in the data base.

One interesting note about the elements of the ORDER BY clause, is that it is not required that these elements also appear in the SELECT clause.

Consider the two different solutions that are presented on the following page.

iSQL*Plus Release 9.0.1 - Microsoft Internet Explorer provid...

File Edit View Favorites Tools Help Address Go

Enter statements:

```
SELECT last_name, first_name, birthdate
FROM      talent
ORDER BY  birthdate DESC
```

Execute Output: Work Screen Clear Screen Sav

LAST_NAME	FIRST_NAME	BIRTHDATE
Bloom	Orlando	13-JAN-77
Farrell	Colin	31-MAY-76
Jolie	Angelina	04-JUN-75
Ryder	Winona	29-OCT-71
Wahlberg	Mark	05-JUN-71
Aniston	Jennifer	11-FEB-69
Roberts	Julia	28-OCT-67
Kidman	Nicole	20-JUN-67
Pitt	Brad	18-DEC-63
Depp	Johnny	09-JUN-63
Moore	Demi	11-NOV-62
Cruise	Tom	03-JUL-62
Clooney	George	06-MAY-61
Pfeiffer	Michelle	29-APR-58

Internet

iSQL*Plus Release 9.0.1 - Microsoft Internet Explorer provid...

File Edit View Favorites Tools Help Address Go

Enter statements:

```
SELECT last_name, first_name
FROM      talent
ORDER BY  birthdate DESC
```

Execute Output: Work Screen Clear Screen Sav

LAST_NAME	FIRST_NAME
Bloom	Orlando
Farrell	Colin
Jolie	Angelina
Ryder	Winona
Wahlberg	Mark
Aniston	Jennifer
Roberts	Julia
Kidman	Nicole
Pitt	Brad
Depp	Johnny
Moore	Demi
Cruise	Tom
Clooney	George
Pfeiffer	Michelle

Done Internet

Occasionally the SQL programmer needs to sort on a secondary column, or series of columns.

The programmer can specify additional columns to sort on, and these secondary sort columns indicate how the output should be sorted, on those occasions when all of the values in the preceding columns are the same.

In other words, the secondary sort columns 'kick in' only when there are duplicate values in the primary sort columns.

The user community has requested a listing of all of our clients alphabetized by last name, within country of origin.

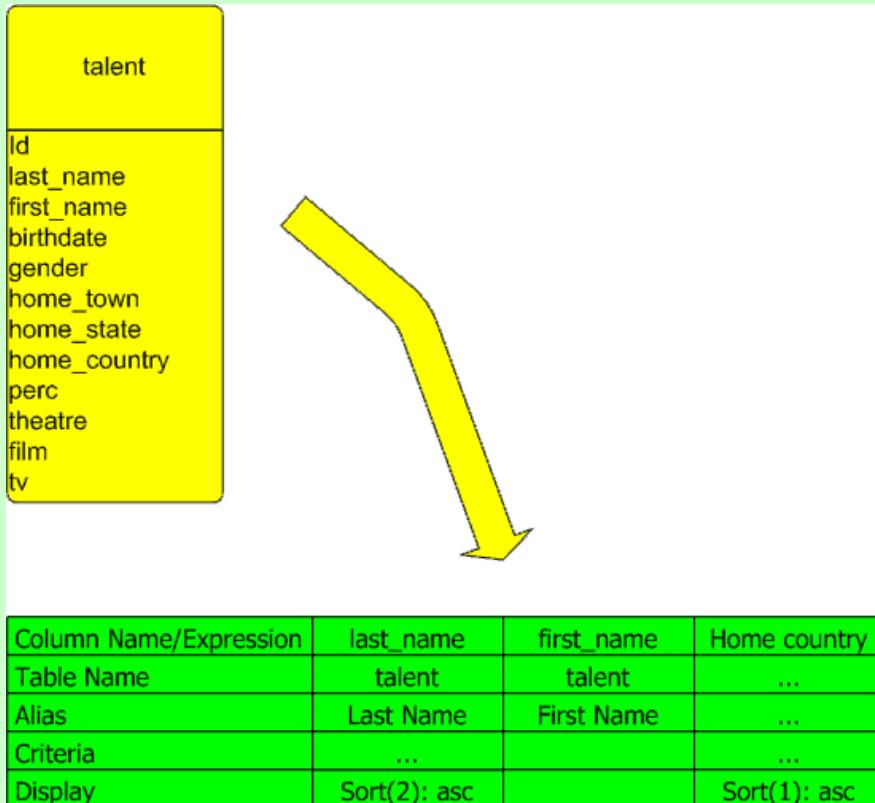
Rephrase: Prepare a report showing the name and home country information for each of our clients. Sort this report using home country as the primary sort field, and last name as the secondary sort field.

Step 1: Build the Table Build Chart (TBC)

Step 2: Double check your TBC solution

Step 3: Transform the TBC into code.

Notice how the sort criteria is specified in the display row.



```
SELECT    last_name, first_name, home_country
FROM      talent
ORDER BY  home_country, last_name;
```


Module 07: Sorting Rows

Page B-15: Problem 8-3 Solution

Here's the solution.

According to this sort, all of the rows are arranged primarily in home_country order. And then, when there are duplicate values in the home_country column, those rows are sorted in last_name order.

The screenshot shows the iSQL*Plus Release 9.0.1 interface within a Microsoft Internet Explorer browser window. The address bar shows 'http://cisdb02.m...'. The 'Enter statements:' text area contains the following SQL query:

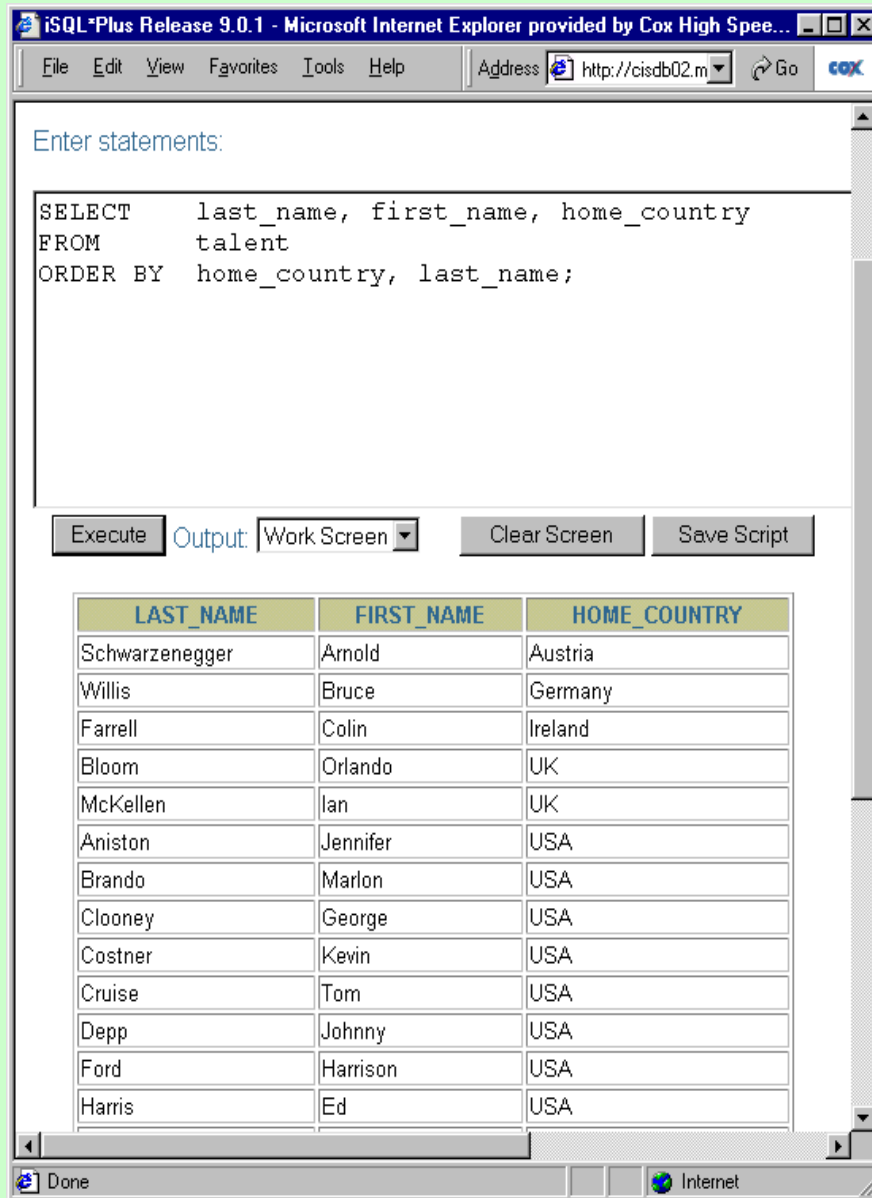
```
SELECT    last_name, first_name, home_country
FROM      talent
ORDER BY  home_country, last_name;
```

Below the text area are buttons for 'Execute', 'Output', 'Work Screen', 'Clear Screen', and 'Save Script'. The 'Output' button is selected, and the results are displayed in a table with the following data:

LAST_NAME	FIRST_NAME	HOME_COUNTRY
Schwarzenegger	Arnold	Austria
Willis	Bruce	Germany
Farrell	Colin	Ireland
Bloom	Orlando	UK
McKellen	Ian	UK
Aniston	Jennifer	USA
Brando	Marlon	USA
Clooney	George	USA
Costner	Kevin	USA
Cruise	Tom	USA
Depp	Johnny	USA
Ford	Harrison	USA
Harris	Ed	USA

Module 07: Sorting Rows

Page B-16: Problem 8-3 Analysis



The screenshot shows the iSQL*Plus Release 9.0.1 interface within a Microsoft Internet Explorer browser. The address bar shows <http://cisdb02.m...>. The "Enter statements:" text area contains the following SQL query:

```
SELECT    last_name, first_name, home_country
FROM      talent
ORDER BY  home_country, last_name;
```

Below the text area are buttons for "Execute", "Output", "Work Screen", "Clear Screen", and "Save Script". The "Output" button is selected, and the results are displayed in a table with the following columns: LAST_NAME, FIRST_NAME, and HOME_COUNTRY.

LAST_NAME	FIRST_NAME	HOME_COUNTRY
Schwarzenegger	Arnold	Austria
Willis	Bruce	Germany
Farrell	Colin	Ireland
Bloom	Orlando	UK
McKellen	Ian	UK
Aniston	Jennifer	USA
Brando	Marlon	USA
Clooney	George	USA
Costner	Kevin	USA
Cruise	Tom	USA
Depp	Johnny	USA
Ford	Harrison	USA
Harris	Ed	USA

Ascending is the default sort option, and since the primary and secondary sorts were both ascending sorts, the programmer opted to omit that keyword from the code.

What do you think about that coding style?

The user community has requested a listing of all of our clients alphabetized by last name, within country of origin. But this time, put the Americans at the top of the list.

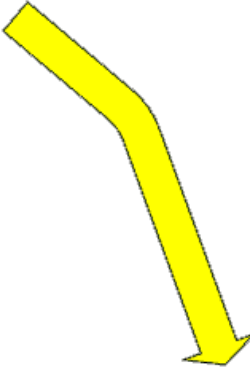
Rephrase: Prepare a report showing the name and home country information for each of our clients. Sort this report using home country as the primary sort field (in descending order), and last name as the secondary sort field (in ascending order).

Step 1: Build the Table Build Chart (TBC)

Step 2: Double check your TBC solution

Step 3: Transform the TBC into code.

Notice how the sort criteria is specified in the display row.

talent			
Id last_name first_name birthdate gender home_town home_state home_country perc theatre film tv			
			
Column Name/Expression	last_name	first_name	Home country
Table Name	talent	talent	...
Alias	Last Name	First Name	...
Criteria
Display	Sort(2): asc		Sort(1): desc

```

SELECT    last_name, first_name, home_country
FROM      talent
ORDER BY  home_country DESC, last_name ASC;
    
```

Module 07: Sorting Rows

Page B-15: Problem 8-4 Solution

Here's the solution.

Notice that the comma in the ORDER BY clause separates one *chunk* of sort information from the other *chunk*.

The screenshot shows the iSQL*Plus web interface in a Microsoft Internet Explorer browser. The address bar shows 'sjc.edu/isqlplus'. The 'Enter statements:' text area contains the following SQL query:

```
SELECT last_name, first_name, home_country
FROM talent
ORDER BY home_country DESC, last_name ASC;
```

Below the text area are buttons for 'Execute', 'Output', 'Work Screen', 'Clear Screen', and 'Save Script'. The 'Output' button is selected, and the results are displayed in a table with three columns: LAST_NAME, FIRST_NAME, and HOME_COUNTRY.

LAST_NAME	FIRST_NAME	HOME_COUNTRY
Aniston	Jennifer	USA
Brando	Marlon	USA
Clooney	George	USA
Costner	Kevin	USA
Cruise	Tom	USA
Depp	Johnny	USA
Ford	Harrison	USA
Harris	Ed	USA
Jackson	Samuel L.	USA
Jolie	Angelina	USA
Kidman	Nicole	USA
Moore	Demi	USA
Pacino	Al	USA
Pfeiffer	Michelle	USA

Module 07: Sorting Rows

The screenshot shows the iSQL*Plus interface in a Microsoft Internet Explorer window. The address bar shows 'sjc.edu/isqlplus'. The 'Enter statements:' text area contains the following SQL query:

```
SELECT last_name, first_name, home_country
FROM talent
ORDER BY home_country DESC, last_name ASC;
```

Below the text area are buttons for 'Execute', 'Output', 'Work Screen', 'Clear Screen', and 'Save Script'. The 'Output' button is selected, and the results are displayed in a table below.

LAST_NAME	FIRST_NAME	HOME_COUNTRY
Aniston	Jennifer	USA
Brando	Marlon	USA
Clooney	George	USA
Costner	Kevin	USA
Cruise	Tom	USA
Depp	Johnny	USA
Ford	Harrison	USA
Harris	Ed	USA
Jackson	Samuel L.	USA
Jolie	Angelina	USA
Kidman	Nicole	USA
Moore	Demi	USA
Pacino	Al	USA
Pfeiffer	Michelle	USA

Page B-16: Problem 8-4 Analysis

The user community asked to have the Americans listed at the top of the report, and in this case the programmer used a trick, and just 'lucked out' with this program.

This program only works because USA, at present, is at the end of the list. But what happens when we add talent from West Germany, or Yugoslavia?

Given what we've discussed about SQL, this is the only solution available to you, but I hope you felt a little uneasy about this solution. I hope it didn't feel right to you.

This solution only works because the programmer knows about all of the data in the database. And while it's great to have those kinds of intuitions, it's impossible to know about all of the data, all of the time.

The user community has requested a listing of all of our clients alphabetized by last name, within country of origin. But this time, exclude the Americans from the report.

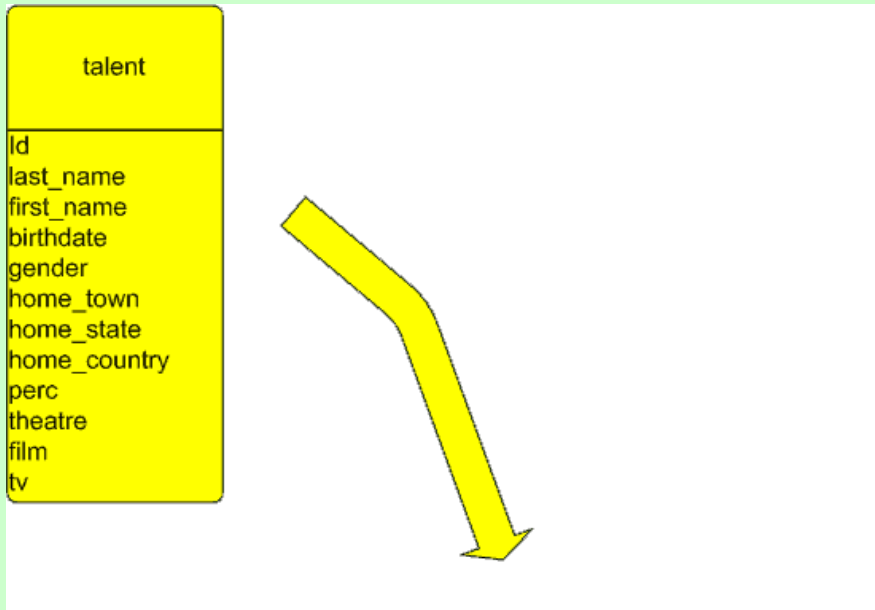
Rephrase: Prepare a report showing the name and home country information for each of our clients.

Sort this report using home country as the primary sort field, and last name as the secondary sort field. Include only those records for talent who were born outside of the USA.

Step 1: Build the Table Build Chart (TBC)

Step 2: Double check your TBC solution

Step 3: Transform the TBC into code.



The TBC is getting pretty busy.

Notice how the home_country column specifies both a sort field, as well as criterion for inclusion

```
SELECT    last_name, first_name, home_country
FROM      talent
WHERE     home_country <> 'USA'
ORDER BY  home_country ASC, last_name ASC;
```

Column Name/Expression	last_name	first_name	Home country
Table Name	talent	talent	...
Alias	Last Name	First Name	...
Criteria	...		<> USA
Display	Sort(2): asc		Sort(1): desc

Module 07: Sorting Rows

Page B-15: Problem 8-5 Solution

Here's the solution.

The screenshot shows the iSQL*Plus web interface in a Microsoft Internet Explorer browser window. The address bar shows 'sjc.edu/isqlplus'. The page has the Oracle logo and 'iSQL*Plus' text. There are links for 'Password', 'Log Out', and 'Help'. Below these are buttons for 'Script Location', 'Browse...', and 'Load Script'. A text area labeled 'Enter statements:' contains the following SQL query:

```
SELECT last_name, first_name, home_country
FROM talent
WHERE home_country <> 'USA'
ORDER BY home_country ASC, last_name ASC;
```

Below the query area are buttons for 'Execute', 'Output' (with a dropdown menu set to 'Work Screen'), 'Clear Screen', and 'Save Script'. The results are displayed in a table with three columns: LAST_NAME, FIRST_NAME, and HOME_COUNTRY.

LAST_NAME	FIRST_NAME	HOME_COUNTRY
Schwarzenegger	Arnold	Austria
Willis	Bruce	Germany
Farrell	Colin	Ireland
Bloom	Orlando	UK
McKellen	Ian	UK

The browser's status bar at the bottom shows 'Done' and 'Internet'.

Module 07: Sorting Rows

Page B-16: Problem 8-5 Analysis

This program demonstrates how the WHERE clause can be used in conjunction with the ORDER BY clause.

The screenshot shows the iSQL*Plus web interface in a Microsoft Internet Explorer browser window. The browser's address bar shows 'sjc.edu/isqlplus'. The page has a header with the Oracle logo, 'iSQL*Plus' text, and links for 'Password', 'Log Out', and 'Help'. Below the header, there is a 'Script Location' field with a 'Browse...' button and a 'Load Script' button. A section labeled 'Enter statements:' contains a text area with the following SQL query:

```
SELECT last_name, first_name, home_country
FROM talent
WHERE home_country <> 'USA'
ORDER BY home_country ASC, last_name ASC;
```

Below the text area are buttons for 'Execute', 'Output' (with a dropdown menu set to 'Work Screen'), 'Clear Screen', and 'Save Script'. The results of the query are displayed in a table with three columns: LAST_NAME, FIRST_NAME, and HOME_COUNTRY.

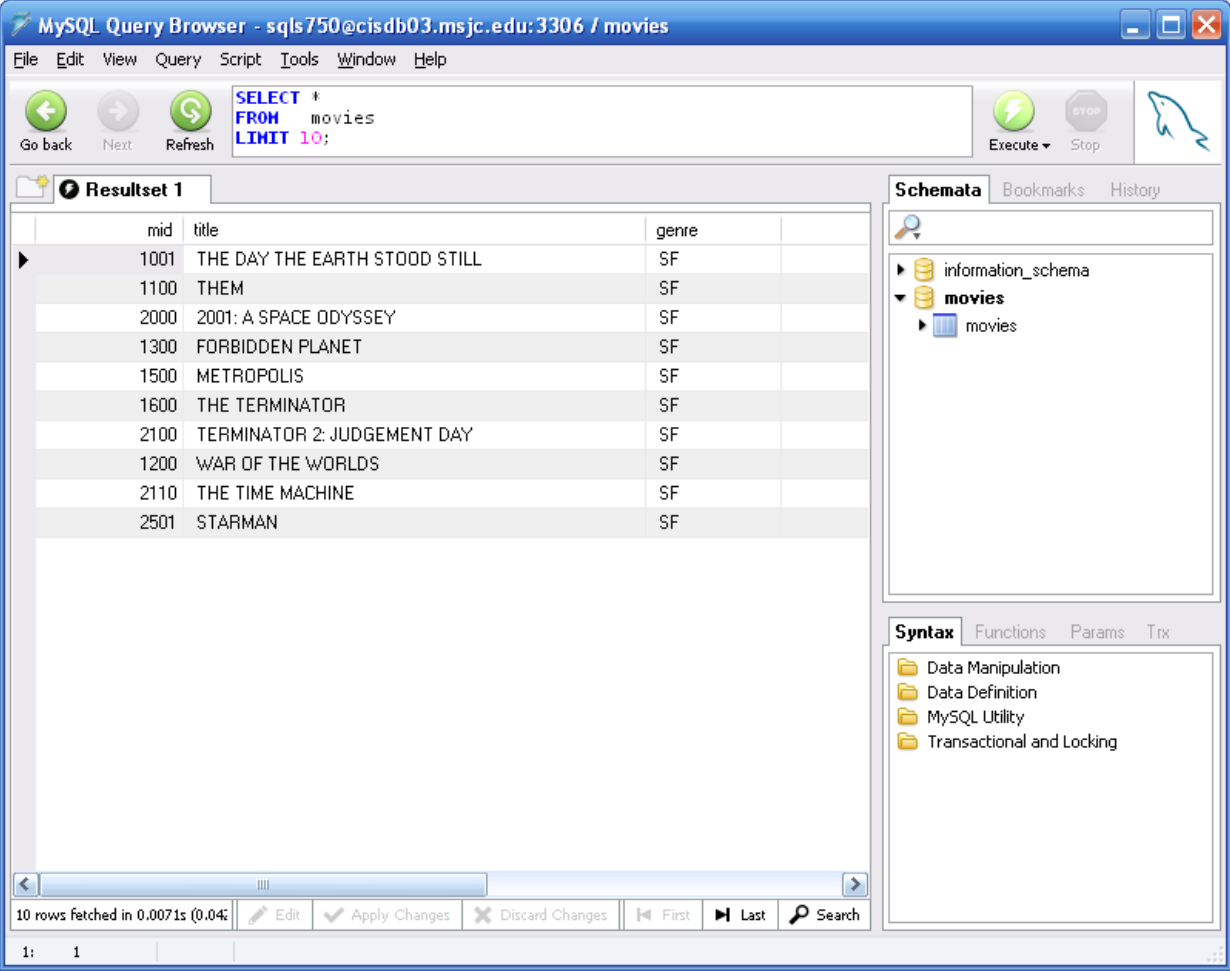
LAST_NAME	FIRST_NAME	HOME_COUNTRY
Schwarzenegger	Arnold	Austria
Willis	Bruce	Germany
Farrell	Colin	Ireland
Bloom	Orlando	UK
McKellen	Ian	UK

The browser's status bar at the bottom shows 'Done' and 'Internet'.

Module 07: Sorting Rows

Page C-1: Limiting Output

In MySQL we can use the LIMIT clause to limit the number of lines of output that will be displayed in the final result table.



The screenshot shows the MySQL Query Browser interface. The query entered is:

```
SELECT *  
FROM movies  
LIMIT 10;
```

The result set, titled "Resultset 1", displays 10 rows of data from the 'movies' table. The columns are 'mid', 'title', and 'genre'. The data is as follows:

mid	title	genre
1001	THE DAY THE EARTH STOOD STILL	SF
1100	THEM	SF
2000	2001: A SPACE ODYSSEY	SF
1300	FORBIDDEN PLANET	SF
1500	METROPOLIS	SF
1600	THE TERMINATOR	SF
2100	TERMINATOR 2: JUDGEMENT DAY	SF
1200	WAR OF THE WORLDS	SF
2110	THE TIME MACHINE	SF
2501	STARMAN	SF

The status bar at the bottom indicates "10 rows fetched in 0.0071s (0.04%)" and provides buttons for "Edit", "Apply Changes", "Discard Changes", "First", "Last", and "Search". The right sidebar shows the "Schemata" tab with a tree view of the database structure, including 'information_schema' and 'movies'. The "Syntax" tab is also visible, showing a list of SQL topics.

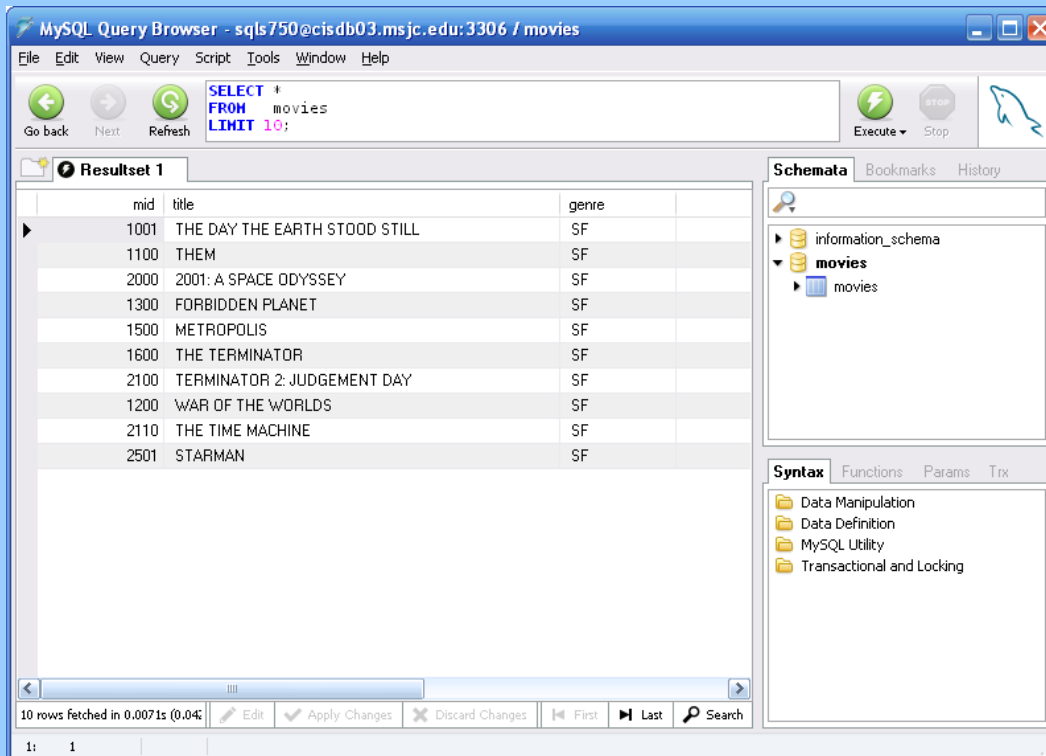
Module 07: Sorting Rows

Page C-2: LIMIT number

The LIMIT clause has two forms:

1. LIMIT number
2. LIMIT skip, number

In this example, we show how the first form can be used to limit the total number of rows that will be displayed in the final result table.



The screenshot shows the MySQL Query Browser interface. The query entered is:

```
SELECT *  
FROM movies  
LIMIT 10;
```

The result set, titled "Resultset 1", displays 10 rows of movie data. The status bar at the bottom indicates "10 rows fetched in 0.0071s (0.04%)" and includes buttons for "Edit", "Apply Changes", "Discard Changes", "First", "Last", and "Search".

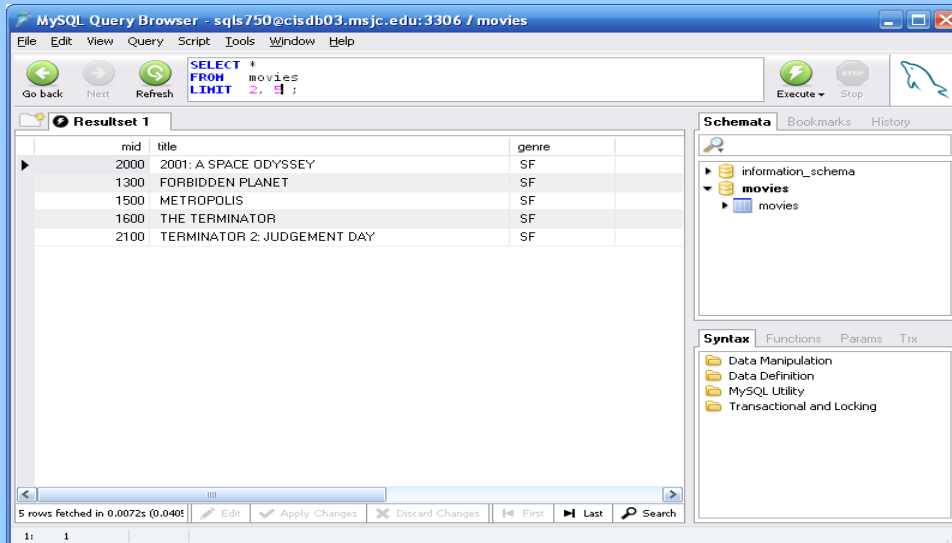
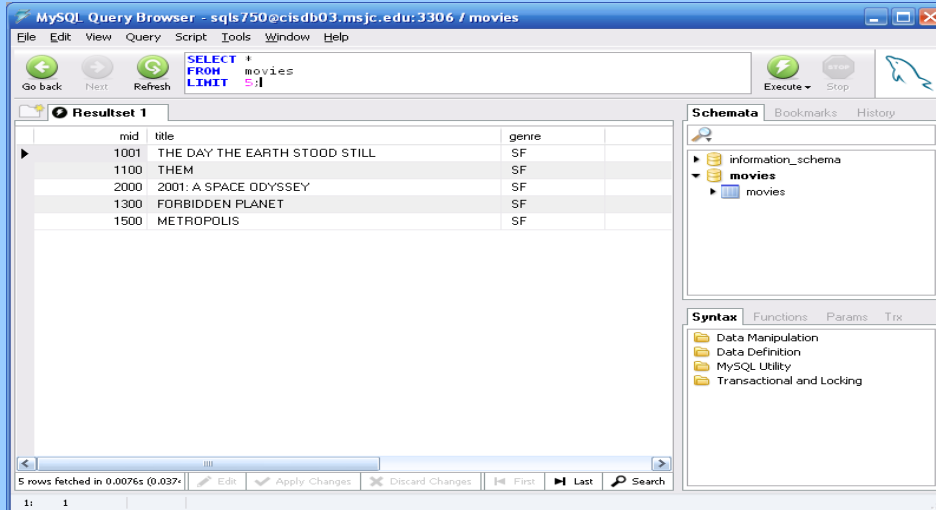
mid	title	genre
1001	THE DAY THE EARTH STOOD STILL	SF
1100	THEM	SF
2000	2001: A SPACE ODYSSEY	SF
1300	FORBIDDEN PLANET	SF
1500	METROPOLIS	SF
1600	THE TERMINATOR	SF
2100	TERMINATOR 2: JUDGEMENT DAY	SF
1200	WAR OF THE WORLDS	SF
2110	THE TIME MACHINE	SF
2501	STARMAN	SF

Module 07: Sorting Rows

Page C-2: LIMIT skip, number

In this example, you can see how the second form can be used to display a number of lines from the result table, after having first skipped over some.

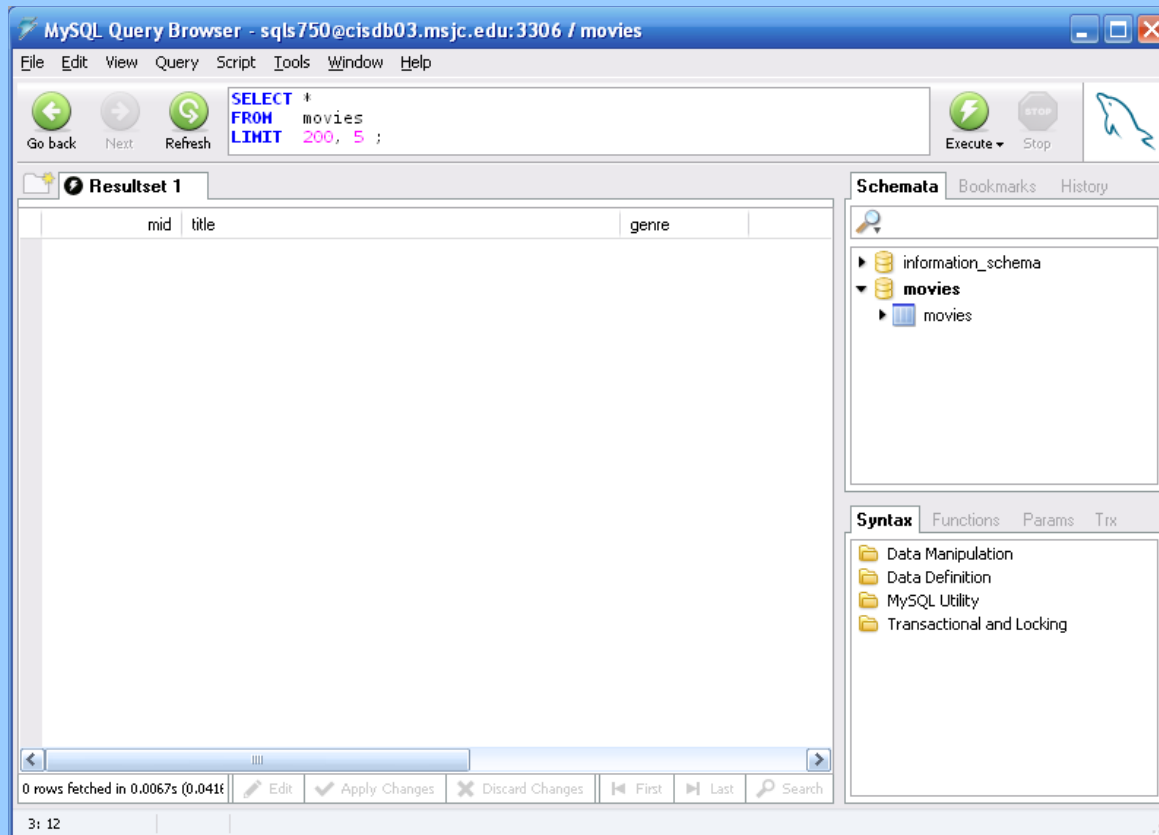
“After skipping 2 records, show the next 5”



Module 07: Sorting Rows

Page C-3: Limiting Output

If there are fewer lines in the result table than the number of lines you told it to skip over, the final result table will be empty. In essence, you skipped over all of the lines in the table.



The LIMIT clause is often used in conjunction with the ORDER BY clause, to find the highest value in a list, or the lowest value in a list.

And we should point out a performance issue here. The LIMIT clause does NOT lessen the workload on the database server in the amount of work it has to perform to satisfy your query.

The only workload that is lessened by the LIMIT clause is the amount of network traffic that would have been consumed had the entire result table been displayed.

Module 07: Sorting Rows

Page T-1: Terminology

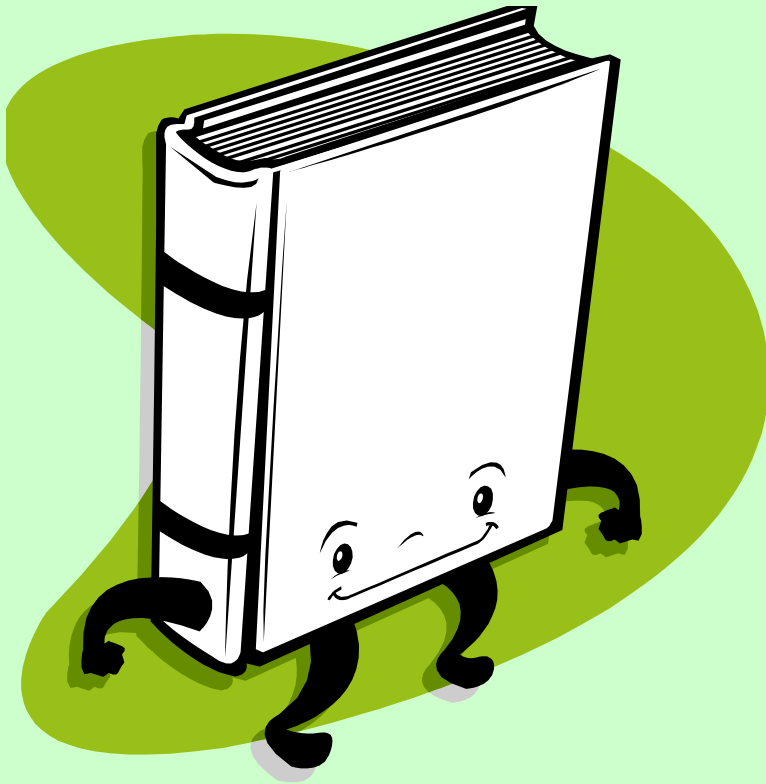
ORDER BY

Primary column, primary sort column

Secondary column, secondary sort column

ASC, DESC

LIMIT



Please drop me an email if you noticed any errors in this module. I'd also appreciate reading your comments, criticisms, and or suggestions as to how this module could be improved.

Thanks,

bil



That's All