

# GNU Sqltutor

a web based interactive tutorial of Structured Query Language (SQL)

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SQLtutor is an interactive online web based tool for teaching and examining students' knowledge of SQL

- introduction of new study branch geoinformatics
  - introduction to relational databases and SQL language
  - background for spatial queries in GIS and other subjects
  - PostgreSQL selected as a main RDBMS in our curricula
- Structured Query Language (SQL)
  - relatively simple language (at least on the basic level)
  - no need of previous background and knowledge of DB
  - ideal candidate for computer based learning
- SQLtutor — an web based interactive tutorial
  - project started in August 2007
  - presented on a faculty seminar
  - first experimental course with master degree. students
  - official status of GNU software in January 2009

**home page** <http://www.gnu.org/software/sqltutor>

**CVS repository** <http://savannah.gnu.org/projects/sqltutor>

**Sqltutor online** <http://sqltutor.fsv.cvut.cz>

**License** GNU General Public License v3 or later

**Sqltutor manual** available online in several formats (HTML, ASCII, Info, dvi, PostScript, PDF)

# Opening Dialog Page

The screenshot shows a web browser window titled "SQL tutor 0.6 - Iceweasel". The address bar contains the URL "http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor". The page content is as follows:

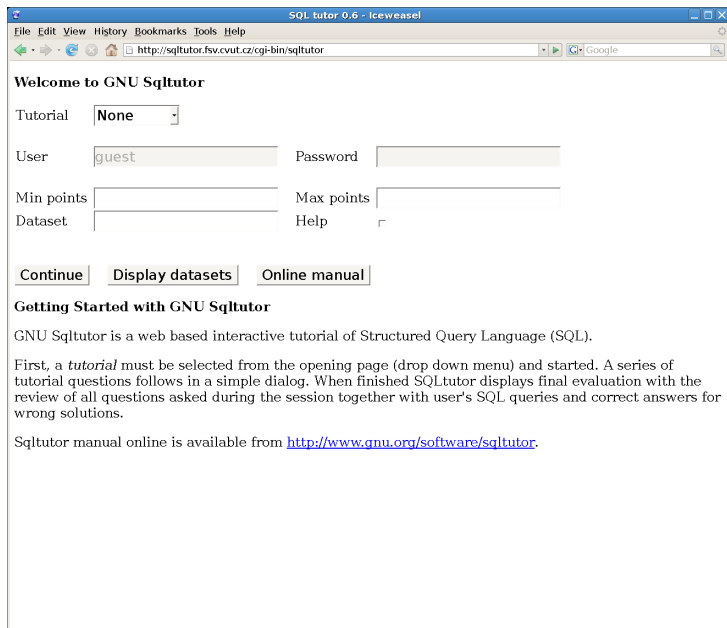
**Welcome to GNU Sqltutor**

Tutorial

User  Password

Min points  Max points

Dataset  Help



The screenshot shows a web browser window titled "SQL tutor 0.6 - Iceweasel". The address bar contains "http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor". The page content includes a "Welcome to GNU Sqltutor" heading, a "Tutorial" dropdown menu set to "None", and input fields for "User" (containing "guest"), "Password", "Min points", and "Max points". There is also a "Dataset" field and a "Help" checkbox. Below these are three buttons: "Continue", "Display datasets", and "Online manual".

**Welcome to GNU Sqltutor**

Tutorial

User  Password

Min points  Max points

Dataset  Help

**Getting Started with GNU Sqltutor**

GNU Sqltutor is a web based interactive tutorial of Structured Query Language (SQL).

First, a *tutorial* must be selected from the opening page (drop down menu) and started. A series of tutorial questions follows in a simple dialog. When finished SQLtutor displays final evaluation with the review of all questions asked during the session together with user's SQL queries and correct answers for wrong solutions.

Sqltutor manual online is available from <http://www.gnu.org/software/sqltutor>.

# Tutorial Datasets

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Google

## Welcome to GNU Sqltutor

Tutorial

User  Password

Min points  Max points

Dataset  Help

dataset	table	columns
bbc	bbc	name, region, area, population, gdp
nobel	nobel	year, subject, winner
buses	stops	id, name
	route	num, company, pos, stop
ttmd	ttmd	games, color, team, country
	team	id, name
ttms	ttms	games, color, who, country
	country	id, name
ttws	ttws	games, color, who, country
	games	year, city, country
movies	actor	id, name
	movie	id, title, year, score, votes, director
	casting	movieid, actorid, ord

# Running a Tutorial

The screenshot shows a web browser window titled "SQL tutor 0.6 - Iceweasel". The address bar contains the URL "http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor". The browser's menu bar includes "File", "Edit", "View", "History", "Bookmarks", "Tools", and "Help".

On the right side of the page, there is a button labeled "Finish test".

Table	Columns
stops	id, name
route	num, company, pos, stop

Below the table, the text "How many stops are in the database?" is displayed.

On the left side, there is a button labeled "Next question".

Below the question, there is a large empty rectangular box for the user's answer.

At the bottom of the page, there are two buttons: "Execute SQL" and "Display data".



# Table Data (part 1)

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
stops	id, name
route	num, company, pos, stop

How many stops are in the database?

Next question

Execute SQL Display data

stops	
<i>id</i>	<i>name</i>
1	Aberlady
2	Abington
3	Amisfield Park
4	Ancrum
5	Armadale
6	ASDA

# Table Data (part 2)

The screenshot shows the SQL tutor 0.6 interface. The browser address bar displays `http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor`. On the left, a list of stops is shown with their corresponding numbers. Below this list, a table view of the 'route' table is displayed, showing columns for 'num', 'company', 'pos', and 'stop'.

238	Wallyford
239	Wardie
240	Waverley Bridge
241	West Linton
242	West Mains
243	Westburn
244	Wester Hailes
245	Wester Hailes Centre
246	Whitburn
247	Whitecraig
248	Wilkieston
249	Willowbrae
250	Winchburgh

route			
num	company	pos	stop
1	LRT	1	137
1	LRT	2	99
1	LRT	3	59
1	LRT	4	66
1	LRT	5	42
1	LRT	6	48
1	LRT	7	223
1	LRT	8	92
1	LRT	9	205
1	LRT	10	80
1	LRT	11	137
2	LRT	1	173
2	LRT	2	191

# A First Try

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
stops	id, name
route	num, company, pos, stop

How many stops are in the database?

Next question

```
SELECT COUNT(stop) FROM route
```

Execute SQL Display data

Wrong answer

1174

# A Better Guess

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
stops	id, name
route	num, company, pos, stop

How many stops are in the database?

Next question

```
SELECT COUNT(DISTINCT stop) FROM route
```

Execute SQL Display data

Correct answer

246

# A Correct Answer

The screenshot shows a web browser window titled "SQL tutor 0.6 - Iceweasel". The address bar contains "http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor". The page content includes a table with two columns: "Table" and "Columns". The table lists two tables: "stops" with columns "id, name" and "route" with columns "num, company, pos, stop". A "Finish test" button is in the top right. Below the table is the question "How many stops are in the database?". A "Next question" button is below the question. A text input field contains the SQL query "SELECT COUNT(\*) FROM stops". Below the input field are "Execute SQL" and "Display data" buttons. The "Correct answer" section shows the number "246" in a text input field.

Table	Columns
stops	id, name
route	num, company, pos, stop

How many stops are in the database?

**Next question**

```
SELECT COUNT(*) FROM stops
```

**Execute SQL** **Display data**

**Correct answer**

246

# Setting Help in Opening Page

The screenshot shows a web browser window titled "SQL tutor 0.6 - Iceweasel". The address bar contains the URL "http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor". The page content includes a navigation menu (File, Edit, View, History, Bookmarks, Tools, Help) and a "Welcome to GNU Sqltutor" heading. Below the heading are several form fields: "Tutorial" (set to "SQLzoo"), "User" (set to "guest"), "Password", "Min points", "Max points", "Dataset", and "Help". The "Help" button is circled in red. At the bottom of the page, there are three buttons: "Continue", "Display datasets", and "Online manual". The browser's status bar at the bottom shows the email "emacs@hrosik.chello.upc.cz", the page title "SQL tutor 0.6 - Iceweasel", and the location "USA".

# Help Button

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
stops	id, name
route	num, company, pos, stop

How many stops are in the database?

Next question

```
SELECT COUNT(*) FROM route
```

Execute SQL Display data **Help**

```
SELECT COUNT(*) FROM stops;
```

Wrong answer

1174

# More Examples

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
actor	id, name
movie	id, title, year, score, votes, director
casting	movieid, actorid, ord

List the films in which 'Harrison Ford' has appeared

Next question

```
SELECT title
FROM movie, casting, actor
WHERE name='Harrison Ford'
AND movieid=movie.id
AND actorid=actor.id
AND ord>1;
```

Execute SQL Display data

Correct answer

Conversation, The
American Graffiti
Apocalypse Now
Star Wars
Star Wars: Episode VI - Return of the Jedi
Star Wars: Episode V - The Empire Strikes Back



# More Examples

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
stops	id, name
route	num, company, pos, stop

Give a list of the services which connect the stops 'Craiglockhart' and 'Tollcross'

Next question

```
SELECT R1.company, R1.num
FROM route R1, route R2, stops S1, stops S2
WHERE R1.num=R2.num AND R1.company=R2.company
AND R1.stop=S1.id AND R2.stop=S2.id
AND S1.name='Craiglockhart'
AND S2.name='Tollcross';
```

Execute SQL Display data

Correct answer

LRT	10
LRT	27
LRT	45
LRT	47

# More Examples

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
actor	id, name
movie	id, title, year, score, votes, director
casting	movieid, actorid, ord

List the film title and the leading actor for all of 'Julie Andrews' films.

Next question

```
SELECT title, name
FROM movie, casting, actor
WHERE movieid=movie.id
AND actorid=actor.id
AND ord=1
AND movieid IN
(SELECT movieid FROM casting, actor
WHERE actorid=actor.id
AND name='Julie Andrews');
```

Execute SQL Display data

Correct answer

Sound of Music, The	Julie Andrews
10	Dudley Moore
Victor/Victoria	Julie Andrews

# Closing the Test

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Finish test

Table	Columns
bbc	name, region, area, population, gdp

Find each country that belongs to a region where all populations are less than 25000000. Show name, region and population.

Next question

```
SELECT name,region,population FROM bbc x
WHERE 25000000 >= ALL (
  SELECT population FROM bbc y
  WHERE x.region=y.region
  AND y.population>0)
```

Execute SQL Display data

# Final Score

SQL tutor 0.6 - Iceweasel

File Edit View History Bookmarks Tools Help

http://sqltutor.fsv.cvut.cz/cgi-bin/sqltutor

Test finished ... 00:44:04 (session 7)

Number of questions : 21  
Correct answers : 17  
Total points : 87  
Evaluation : 70

**New test**

**501 (1):**

Table	Columns
stops	id, name
route	num, company, pos, stop

How many stops are in the database?

**Wrong answer**

```
SELECT COUNT(*) FROM route
```

**Correct answer**

```
SELECT COUNT(*) FROM stops;
```

**306 (1):**

Table	Columns
actor	id, name
movie	id, title, year, score, votes, director
casting	movieid, actorid, ord

What is the id of the film 'Casablanca'?

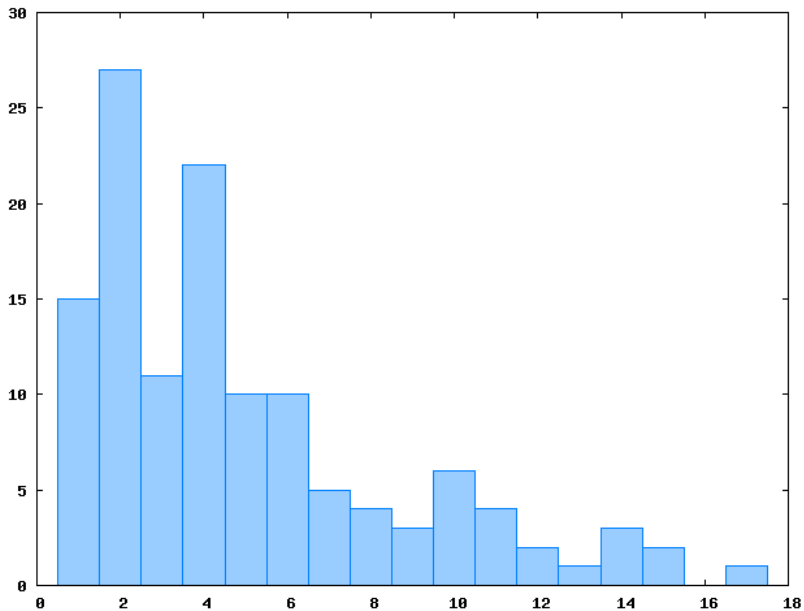
```
SELECT id FROM movie WHERE title='Casablanca';
```

# Evaluation

$$\text{evaluation} = \left[ \left( \sum_{\text{correct answers}} \text{points} \right) \times \frac{\text{number of correct answers}}{\text{number of all questions asked}} \right]$$

<i>evaluation</i>	<i>grade</i>
90	A
75	B
60	C
45	D
30	E
less than 30	F

# Distribution of Questions by Points



- some formal adjustments of source codes to be fully compliant with GNU coding standards
- possible redesign of the Sqltutor database schema to have better support for multilingual tutorial
- build a large and reliable English tutorial SQL with datasets that can be generally understood even outside the English speaking countries
- analyze the new algorithm for random selection of questions, implement a better strategy if needed,
- possible new parameters for final evaluation
- a tutorial for PostGIS spatial enhancement of PostgreSQL database

Thank you for your attention