PostgreSQL Exam Preparation II

Exam problems for the PostgreSQL course @ Software University.

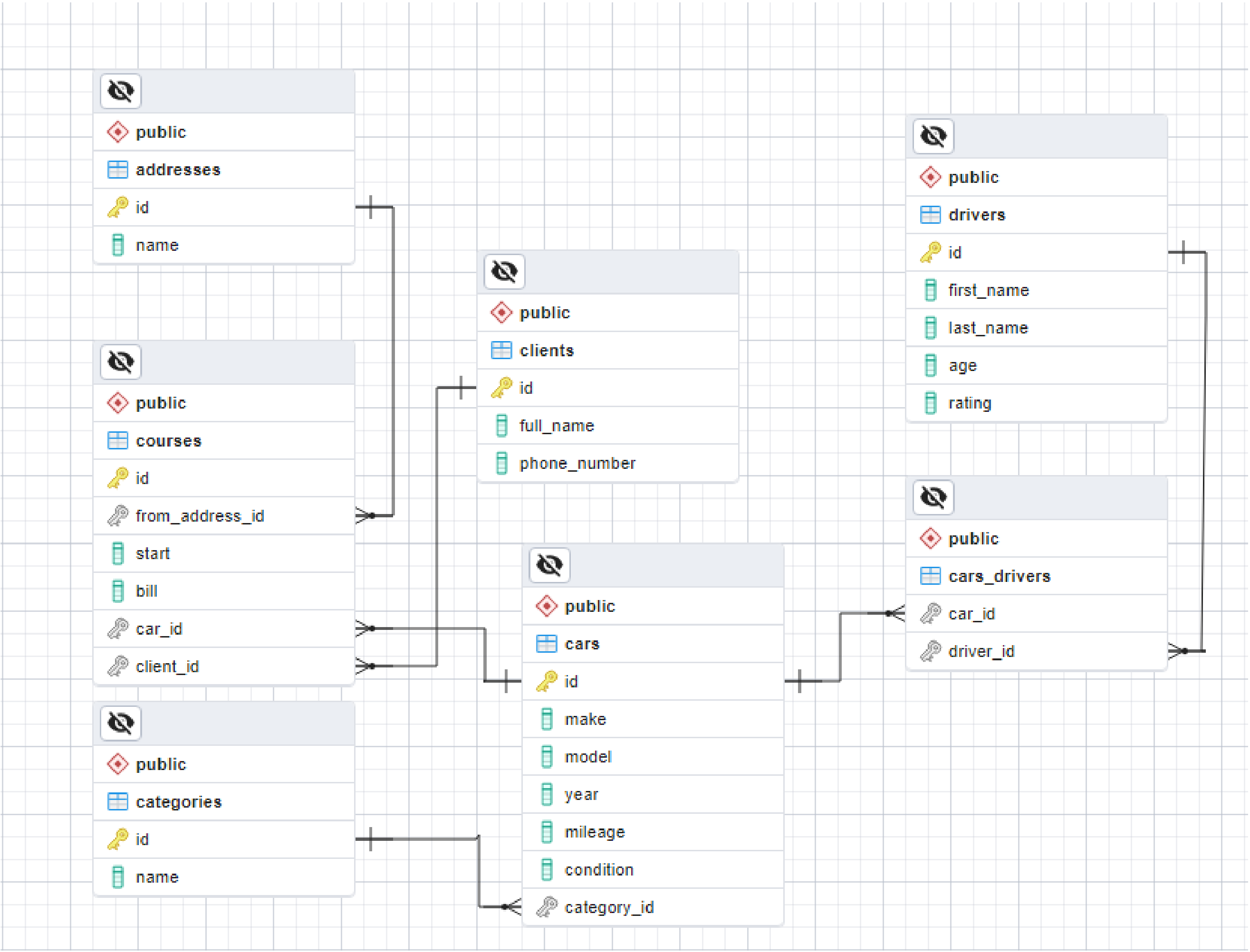
Submit your solutions in the SoftUni Judge Contest.

Taxi Company

As one of the top-performing students at SoftUni, you have been assigned the challenging responsibility of designing a sample database for a new venture - a taxi company. Despite being less familiar with this industry, you will be provided with a comprehensive document outlining the requirements for this database. Additionally, you will receive test data that will enable you to conduct thorough testing and demonstrate your successful completion of the task.

Section 1. Data Definition Language (DDL) - (30 pts)

You have been provided with an E/R Diagram depicting the structure of the **Taxi Company**.



Create a PostgreSQL database named **"taxi_db"** and design the following tables:

- **"addresses"** - contains information about the addresses;
- **"categories"** - stores information about the categories;
- **"clients"** - stores information about the clients;
- **"drivers"** - holds information about the drivers;
- **"cars"** - contains information about the cars.
- **"courses"** - stores information about the courses.

- **"cars_drivers"** - serves as a many-to-many mapping table between cars and drivers.

NOTE: Please ensure that you use the exact data types specified in the model tables when working with dates. For instance, if a column is of type "DATE," make sure to use the "DATE" type. Similarly, if a column is of type "TIMESTAMP" use the "TIMESTAMP" data type. Failure to use the correct data types may result in the Judge system rejecting your submission as incorrect.

Furthermore, it's important to keep in mind that foreign keys should adhere to the following naming convention:

fk_<referencing_table>_<referenced_table>

Your first assignment is to create the database tables based on the provided models. Follow the give n specifications to create the tables

addresses

Column Name	Data Type	Constraints
id	**Integer** from **0** to **2,147,483,647**	Primary Key, Unique table identification, Auto-increment
name	**String** up to **100** symbols	**NULL** is **not** allowed

categories

Column Name	Data Type	Constraints
id	**Integer** from **0** to **2,147,483,647**	Primary Key, Unique table identification, Auto-increment
name	**String** up to **10** symbols	**NULL** is **not** allowed

clients

Column Name	Data Type	Constraints
id	**Integer** from **0** to **2,147,483,647**	Primary Key, Unique table identification, Auto-increment
full_name	**String** up to **50** symbols	**NULL** is **not** allowed
phone_number	**String** up to **20** symbols	**NULL** is **not** allowed

drivers

Column Name	Data Type	Constraints
id	**Integer** from **0** to **2,147,483,647**	Primary Key, Unique table identification, Auto-increment
first_name	**String** up to **30** symbols	**NULL** is **not** allowed
last_name	**String** up to **30** symbols	**NULL** is **not** allowed
age	**Integer** from **0** to **2,147,483,647**	**NULL** is **not** allowed, Must be a positive number

rating	**Numeric** number with two-digit precision	The **DEFAULT** value is **5.5** **NULL** is permitted

cars

Column Name	Data Type	Constraints
id	**Integer** from **0** to **2,147,483,647**	Primary Key, Unique table identification, Auto-increment
make	**String** up to **20** symbols	**NULL** is **not** allowed
model	**String** up to **20** symbols	**NULL** is permitted
year	**Integer** from **0** to **2,147,483,647**	The **DEFAULT** value is **0** and is a positive number, **NULL** is **not** allowed,
mileage	**Integer** from **0** to **2,147,483,647**	The **DEFAULT** value is **0** and is a positive number, **NULL** is permitted
condition	**String** limited to **1** character	**NULL** is **not** allowed
category_id	**Integer** from **0** to **2,147,483,647**	Relationship with table **categories**, Cascade Operations, **NULL** is **not** allowed

courses

Column Name	Data Type	Constraints
id	**Integer** from **0** to **2,147,483,647**	Primary Key, Unique table identification, Auto-increment
from_address_id	**Integer** from **0** to **2,147,483,647**	Relationship with table **addresses**, Cascade Operations, **NULL** is **not** allowed
start	**TIMESTAMP** when the course starts	**NULL** is **not** allowed
bill	**Numeric** number with ten-digit precision and two-digit scale	The **DEFAULT** value is **10**, Must be a positive number, **NULL** is permitted
car_id	**Integer** from **0** to **2,147,483,647**	Relationship with table **cars**, Cascade Operations, **NULL** is **not** allowed
client_id	**Integer** from **0** to **2,147,483,647**	Relationship with table **clients**, Cascade Operations, **NULL** is **not** allowed

cars_drivers

Column Name	Data Type	Constraints
car_id	**Integer** from **0** to **2,147,483,647**	Relationship with table **cars**, Cascade Operations, **NULL** is **not** allowed
driver_id	**Integer** from **0** to **2,147,483,647**	Relationship with table **drivers**, Cascade Operations, **NULL** is **not** allowed

1. Database Design

Submit only your **CREATE** statements for all tables to the Judge.

Section 2. Data Manipulation Language (DML) - (10 pts)

Prior to beginning, it is necessary to import "`dataset.sql`". If the structure has been properly created, the data should be inserted successfully.

In this scenario, you have multiple tasks that involve manipulating the database, such as modifying data and adding new entries.

2. Insert

When drivers require transportation and are not working, they should be registered as customers in the database. Your task is to insert records into the **"clients"** table based on the **"drivers"** table. Specifically, for drivers with an **"id" between 10** and **20** (**inclusive**), you need to insert data into the **"clients"** table with the following values:

- **"full_name"** - combine the **"first_name"** and **"last_name"** of the driver, separated by a **single space**;
- **"phone_number"** - set it to begin with **"(088) 9999"** followed by the driver's **"id" multiplied** by **2**. For instance, if the driver's **"id"** is **10**, the phone number should be **"(088) 999920"**.

Example

id	full_name	phone_number
1	Kalindi Keningham	(704) 2502909
2	Lois Leidl	(933) 4279635
3	Casi Farens	(933) 4275652
…	…	…
99	Marsha Cridge	(230) 6839868
100	Elysha Maydwell	(842) 4057110
101	Delaney Stove	(088) 999920
102	Ilaire Tomaszewicz	(088) 999922
103	Genna Jaquet	(088) 999924
104	Carlotta Dykas	(088) 999926
…	…	…
110	Roddie Gribben	(088) 999938
111	Boyce Briddock	(088) 999940

3. Update

To account for the wear and tear that occurs over time and long distances, it is necessary to update the condition of **"cars"** in the database. All cars meeting the following criteria should be updated to have a **"condition"** of **'C'**:

- the cars must have a **"mileage" greater than 800,000** (**inclusive**) or have a **NULL** value;
- the cars must be **older than or equal** to **2010**;
- cars with a **"make"** value of **'Mercedes-Benz'** should be **skipped**, as they are expected to continue functioning well.

Example

Before update

id	make	model	year	mileage	condition	Category_id
1	Land Rover	Range Rover	2021	550259	A	3
2	GMC	Sierra 3500	2012	275538	A	4
3	Infiniti	IPL G	2004	[null]	B	1
…	…	…	…	…	…	…
18	Infiniti	G35	2004	[null]	A	2
…	…	…	…	…	…	…
26	Volkswagen	Jetta	2002	345452	C	3
27	Aston Martin	Vantage	2010	890984	C	4
…	…	…	…	…	…	…
36	Mitsubishi	Pajero	2005	921496	B	4
…	…	…	…	…	…	…

After update

id	make	model	year	mileage	condition	Category_id
1	Land Rover	Range Rover	2021	550259	A	3
2	GMC	Sierra 3500	2012	275538	A	4
3	Infiniti	IPL G	2004	[null]	C	1
…	…	…	…	…	…	…
18	Infiniti	G35	2004	[null]	C	2
…	…	…	…	…	…	…
26	Volkswagen	Jetta	2002	345452	C	3
27	Aston Martin	Vantage	2010	890984	C	4

…	…	…	…	…	…	…
36	Mitsubishi	Pajero	2005	921496	C	4
…	…	…	…	…	…	…

4. Delete

As part of the assignment, you are tasked with removing **"clients"** from the database who have not recently used the services of the company. The criteria for removal are as follows: delete all clients from the clients table who do **not have any associated courses** and have a **"full_name" length greater than 3** characters.

Example

Before delete

id	full_name	phone_number
1	Kalindi Keningham	(704) 2502909
2	Lois Leidl	(933) 4279635
3	Casi Farens	(933) 4275652
4	Janna Kellert	(353) 9465732
…	…	…
10	Meris Shale	(842) 4350411
11	Colline Dann	(698) 8299305
12	Joyann Garrettson	(858) 8642667
13	Shane Arr	(261) 2901780
14	Owen Strivens	(807) 1053029
…	…	

After delete

id	full_name	phone_number
2	Lois Leidl	(933) 4279635
4	Janna Kellert	(353) 9465732
…	…	…
12	Joyann Garrettson	(858) 8642667
14	Owen Strivens	(807) 1053029
…	…	

Section 3. Querying - (40 pts)

Now we will perform some data extraction tasks. Please note that the example results provided in this section are based on a fresh database. It is highly recommended to clear the database that was manipulated in the previous problems from the DML section and insert the given dataset again to ensure consistency with the examples in this section.

5. Cars

Extract information about all the **"cars"**, including their **"make"**, **"model"**, and **"condition"**. Sort the results in ascending order based on the car's **"id"**.

Example

make	model	condition
Land Rover	Range Rover	A
GMC	Sierra 3500	A
Infiniti	IPL G	B
Pontiac	Grand Prix	C
…	…	…
Ford	E250	C
Infiniti	EX	C

6. Drivers and Cars

Retrieve comprehensive information about drivers and their cars. Extract the **"first_name"** and **"last_name"** of each driver, along with the **"make"**, **"model"**, and **"mileage"** of their cars. Arrange the results in **descending order** of **"mileage"**. If there are any drivers with the same mileage, sort them **alphabetically** by **"first_name"**. **Exclude** any cars that have a **NULL** value for **"mileage"**.

Example

first_name	last_name	make	model	mileage
Edna	Heatley	Pontiac	Trans Sport	967608
Delaney	Stove	Pontiac	Fiero	959778
Cristi	Ravenshear	Maserati	GranTurismo	954606
…	…	…	…	…
Ailina	Sebyer	Mercedes-Benz	G-Class	6482
Gerhard	Alderson	Mercedes-Benz	G-Class	6482

7. Number of Courses for Each Car

Your task is to write an SQL query that retrieves information from the database regarding all the cars and the count of their courses. Additionally, you need to display the **"average_bill"** of each course for each car, **rounded to the second decimal digit**. The results should be ordered in **descending order** based on the **"count_of_courses"**. In case multiple cars have the same number of courses, the results should be further ordered by the car's **"id"**. You should **exclude** cars that have **exactly 2 courses** from the results.

Example

car_id	make	mileage	count_of_courses	average_bill
13	Mercedes-Benz	846549	4	26.95
80	Lincoln	711184	4	22.39
1	Land Rover	550259	3	14.71
	…	…	…	…
89	Pontiac	890015	0	[null]
90	Mercedes-Benz	6482	0	[null]
95	Land Rover	176967	0	[null]

8. Regular Clients

Extract details of regular clients who have traveled in **multiple cars**. Filter the clients based on the condition that the **second letter** of their **full name** is **'a'**. Retrieve the **"full_name"**, and **"count_of_cars"** they have traveled in and the **"total_sum"** of their course **bills**. Sort the result by the **"full_names"** of the clients.

Example

full_name	count_of_cars	total_sum
Haven Seaton	4	129.65
Jacquelynn Plackstone	2	64.36
Kaylee Coushe	4	135.71
…	…	…
Raynor Dobbison	2	66.77

9. Full Information of Courses

The headquarters has requested a query to retrieve comprehensive information about all courses in the database. The required information includes the **"address"**, whether the course was conducted during the **'Day'** (**between 6 and 20, inclusive**) or the **'Night'**(**between 21 and 5, inclusive**), the course **"bill"**, the **"full_name"** of the client, the car **"make"**, **"model"**, and the **"category_name"**. The results should be ordered by the course **"id"**.

Example

address	day_time	bill	full_name	make	model	category_name
2 Del Mar Park	Night	46.92	Randie Cridge	Mitsubishi	Galant	Hatchback

24402 Warner Place	Day	14.47	Henrik Sivyer	Lincoln	MKT	Hatchback
80678 Green Ridge Court	Day	44.01	Randie Cridge	Isuzu	Rodeo Sport	Cabrio
…	…	…	…	…	…	…
34 Briar Crest Crossing	Night	14.86	Georges Lanston	Isuzu	Rodeo Sport	Cabrio
86462 Buena Vista Point	Day	16.06	Jefferson Montacute	Buick	Hearse	Coupe

Section 4. Programmability - (20 pt)

10. Find all Courses by Client’s Phone Number

As an assignment, your task is to create a user-defined function named **fn_courses_by_client()** that accepts a client's phone number as a parameter (**"phone_num"** of type **VARCHAR(20)**) and returns the **number of courses** that the client has in the database.

For this task, please only submit your **user-defined function** in the Judge system.

Example

Query	Output
SELECT fn_courses_by_client('(803) 6386812')	5
SELECT fn_courses_by_client('(831) 1391236')	3
SELECT fn_courses_by_client('(704) 2502909')	0

11. Full Info for Address

You are required to create a stored procedure named **sp_courses_by_address()** that accepts a parameter **"address_name"** with a **maximum length of 100**. The procedure should retrieve information about addresses that match the given **"address_name"**. The extracted data should include the **"address_name"**, client's **"full_name"**, the **"level_of_bill"** (categorized as **'Low'** if the bill is less than or equal to **20**, **'Medium'** if it is less than or equal to **30**, and **'High'** otherwise), the car's **"make"** and **"condition"**, and the **"category_name"**. The results should be ordered by the car's **"make"**. In case there are multiple courses made by the same car, the results should be further sorted by the client's **"full_name"**.

******* Please be aware that to view the procedure's results in a tabular format and conduct efficient testing within the Judge System, it's crucial to establish a table named **"search_results"**. This table will serve as a container for the data generated by your stored procedure. Prior to creating the procedure, itself, execute the subsequent SQL query to create the **"search_results"** table:

```
CREATE TABLE search_results (
    id SERIAL PRIMARY KEY,
    address_name VARCHAR(50),
    full_name VARCHAR(100),
    level_of_bill VARCHAR(20),
    make VARCHAR(30),
    condition CHAR(1),
    category_name VARCHAR(50)
);
```

In this task, please ensure that you only submit your **stored procedure and the SQL query to create the table** in the Judge system.

Example

Query

`CALL usp_courses_by_address('700 Monterey Avenue')`
 	
`SELECT * FROM search_results;`

Output					
address_name	**full_name**	**level_of_bill**	**make**	**condition**	**category_name**
700 Monterey Avenue	Kelcy Cody	Medium	Acura	B	Hatchback
…	…	…	…	…	…
700 Monterey Avenue	Courtney Gawkes	Low	Mercedes-Benz	B	Cabrio
700 Monterey Avenue	Jeralee Tue	Low	Mercedes-Benz	B	Cabrio
700 Monterey Avenue	Haven Seaton	High	Mitsubishi	B	Hatchback

Query

`CALL usp_courses_by_address('66 Thompson Drive')`
 	
`SELECT * FROM search_results;`

Output					
address_name	**full_name**	**level_of_bill**	**make**	**condition**	**category_name**
66 Thompson Drive	Kimball Deem	High	Pontiac	C	Hatchback
66 Thompson Drive	Kaylee Coushe	High	Porsche	B	Coupe
66 Thompson Drive	Gibbie Liggens	High	Volkswagen	A	Coupe