# PostgreSQL Exam Preparation III

Exam problems for the [PostgreSQL course @ Software University](https://softuni.bg/trainings/4244/postgresql-september-2023).

**Submit your solutions** in the SoftUni [Judge Contest](https://judge.softuni.org/Contests/4298/Exam-Prep-III).

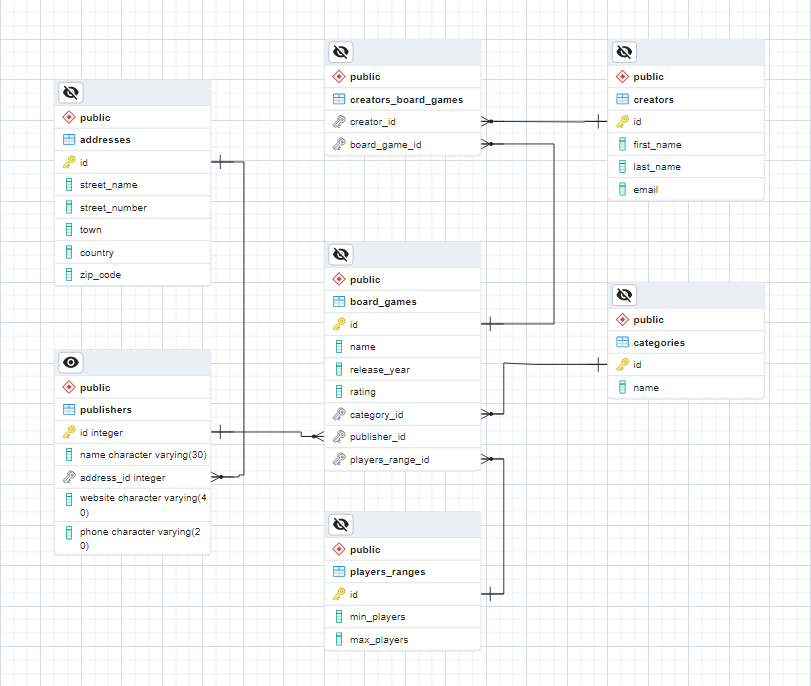
# Board Games

# *Emily has a passion for collecting and playing all sorts of board games. Her game collection has grown significantly over the years, and she is constantly on the lookout for new and exciting games to add to it.*

# *As her collection grew, Emily found it increasingly challenging to keep track of all the games she owned. She realized that she needed a way to manage her collection more efficiently and decided to create a database that would store all the relevant information about her games.*

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

The following E/R Diagram of the **Board Games** database was created by Emily.



Assist Emily in setting up a PostgreSQL database called **"board\_games\_db"** which should include seven tables:

* **"categories"** - hold data about the name of each board game category;
* **"addresses"** - store information regarding the locations of board game publishers;
* **"publishers"** - contain information about the publishers of the board games;
* **"players\_ranges"** - hold information about the minimum and maximum player counts for each game;
* **"creators"** - store data about the creators of the board games;
* **"board\_games"** - contain information about each individual board game;
* **"creators\_board\_games"** - serves as a mapping table between the creators and board games.

**NOTE: 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 given specifications to create the tables. Ensure that the constraints match the order of columns.

##### **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 **50** symbols | **NULL** is **not** allowed |

##### **addresses**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| **id** | **Integer** from **0** to **2,147,483,647** | Primary Key, Unique table identification, Auto-increment |
| **street\_name** | **String** up to **100** symbols | **NULL** is **not** allowed |
| **street\_number** | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Must be a positive number |
| **town** | **String** up to **30** symbols | **NULL** is **not** allowed |
| **country** | **String** up to **50** symbols | **NULL** is **not** allowed |
| **zip\_code** | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Must be a positive number |

##### **publishers**

|  |  |  |
| --- | --- | --- |
| **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 **30** symbols | **NULL** is **not** allowed. |
| **address\_id** | **Integer** from **0** to **2,147,483,647** | Relationship with table **addresses**, Cascade Operations, **NULL** is **not** allowed |
| **website** | **String** up to **40** symbols | **NULL** is permitted |
| **phone** | **String** up to **20** symbols | **NULL** is permitted |

##### **players\_ranges**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| **id** | **Integer** from **0** to **2,147,483,647** | Primary Key, Unique table identification, Auto-increment |
| **min\_players** | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Must be a positive number |
| **max\_players** | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Must be a positive number |

##### **creators**

|  |  |  |
| --- | --- | --- |
| **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, Unicode | **NULL** is **not** allowed |
| **last\_name** | **String** up to **30** symbols, Unicode | **NULL** is **not** allowed |
| **email** | **String** up to **30** symbols, Unicode | **NULL** is **not** allowed |

##### **board\_games**

|  |  |  |
| --- | --- | --- |
| **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 **30** symbols | **NULL** is **not** allowed |
| **release\_year** | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Must be a positive number |
| **rating** | **Numeric** number with two-digit precision | **NULL** is **not** allowed |
| **category\_id** | **Integer** from **0** to **2,147,483,647** | Relationship with table **categories**,  Cascade Operations, **NULL** is **not** allowed |
| **publisher\_id** | **Integer** from **0** to **2,147,483,647** | Relationship with table **publishers**, Cascade Operations, **NULL** is **not** allowed |
| **players\_range\_id** | **Integer** from **0** to **2,147,483,647** | Relationship with table **players\_ranges**, Cascade Operations, **NULL** is **not** allowed |

##### **creators\_board\_games**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| **creator\_id** | **Integer** from **0** to **2,147,483,647** | Relationship with table **creators**, Cascade Operations, **NULL** is **not** allowed |
| **board\_game\_id** | **Integer** from **0** to **2,147,483,647** | Relationship with table **board\_games**, Cascade Operations, **NULL** is **not** allowed |

## 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.**

This section requires performing various data manipulations:

## Insert

Your task is to insert sample data into the database by writing a query that adds the provided records into their **respective tables**, with **all "id" values generated automatically**.

##### **board\_games**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **name** | **release\_year** | **rating** | **category\_id** | **publisher\_id** | **players\_range\_id** |
| Deep Blue | 2019 | 5.67 | 1 | 15 | 7 |
| Paris | 2016 | 9.78 | 7 | 1 | 5 |
| Catan: Starfarers | 2021 | 9.87 | 7 | 13 | 6 |
| Bleeding Kansas | 2020 | 3.25 | 3 | 7 | 4 |
| One Small Step | 2019 | 5.75 | 5 | 9 | 2 |

##### **publishers**

|  |  |  |  |
| --- | --- | --- | --- |
| **name** | **address\_id** | **website** | **phone** |
| Agman Games | 5 | www.agmangames.com | +16546135542 |
| Amethyst Games | 7 | www.amethystgames.com | +15558889992 |
| BattleBooks | 13 | www.battlebooks.com | +12345678907 |

## Update

The next assignment is to update the **"players\_ranges"** table by increasing the **maximum player** count by **1** for board games that have a player range of **[2, 2]**. Furthermore, you need to change the **names** **of "board\_games"** that were published in **2020 or later** by adding **' V2'** to the end of their original names.

### Example

Before update

|  |  |  |
| --- | --- | --- |
| **id** | **min\_players** | **max\_players** |
| 1 | 2 | 2 |
| 2 | 2 | 3 |
| 3 | 2 | 4 |

After update

|  |  |  |
| --- | --- | --- |
| **id** | **min\_players** | **max\_players** |
| 1 | 2 | 3 |
| 2 | 2 | 3 |
| 3 | 2 | 4 |

Before update

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **id** | **name** | **release\_year** | **rating** | **category\_id** | **publisher\_id** | **players\_range\_id** |
| 1 | Beyond the Sun | 2021 | 8.19 | 6 | 1 | 1 |
| 2 | Sumatra | 2021 | 7.08 | 4 | 2 | 2 |
| … | … | … | … | … | … | … |
| 11 | Glasgow | 2018 | 7.37 | 6 | 11 | 1 |
| … | … | … | … | … | … | … |
| 49 | Bleeding Kansas | 2020 | 3.23 | 3 | 7 | 4 |
| 50 | One Small Step | 2019 | 5.75 | 5 | 9 | 2 |

After update

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **id** | **name** | **release\_year** | **rating** | **category\_id** | **publisher\_id** | **players\_range\_id** |
| 1 | Beyond the Sun V2 | 2021 | 8.19 | 6 | 1 | 1 |
| 2 | Sumatra V2 | 2021 | 7.08 | 4 | 2 | 2 |
| … | … | … | … | … | … | … |
| 11 | Glasgow | 2018 | 7.37 | 6 | 11 | 1 |
| … | … | … | … | … | … | … |
| 49 | Bleeding Kansas V2 | 2020 | 3.23 | 3 | 7 | 4 |
| 50 | One Small Step | 2019 | 5.75 | 5 | 9 | 2 |

## Delete

In the **"addresses"** table, remove all countries that have a **"town"** starting with the letter **'L'**. Take into consideration that there might be **conflicts with foreign key constraints**.

### Example

Before delete

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **id** | **name** | **release\_year** | **rating** | **category\_id** | **publisher\_id** | **players\_range\_id** |
| 1 | Beyond the Sun V2 | 2021 | 8.19 | 6 | 1 | 1 |
| 2 | Sumatra V2 | 2021 | 7.08 | 4 | 2 | 2 |
| … | … | … | … | … | … | … |
| 15 | Alma Mater | 2018 | 7.68 | 5 | 15 | 5 |
| 16 | Santa Monica | 2018 | 7.54 | 4 | 1 | 6 |
| … | … | … | … | … | … | … |
| 46 | Deep Blue | 2019 | 5.67 | 1 | 15 | 7 |
| 47 | Paris | 2016 | 9.87 | 7 | 1 | 5 |
| … | … | … | … | … | … | … |
| 50 | One Small Step | 2019 | 5.75 | 5 | 9 | 2 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **id** | **name** | **address\_id** | **website** | **phone** |
| 1 | Fantasy Flight Games | 5 | www.fantasyflightgames.com | +18553828880 |
| 2 | Z-Man Games | 9 | www.zmangames.com | +12165461654 |
| … | … | … | … | … |
| 16 | Agman Games | 5 | www.agmangames.com | +16546135542 |
| 17 | Amethyst Games | 7 | www.amethystgames.com | +15558889992 |
| 18 | BattleBooks | 13 | www.battlebooks.com | +12345678907 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **id** | **street\_name** | **street\_number** | **town** | **country** | **zip\_code** |
| … | … | … | … | … | … |
| 4 | High Street | 8 | Boston | USA | 68732 |
| 5 | Chapman Ave | 15 | Los Angeles | USA | 35746 |
| 6 | Zaokopowa | 534 | Warsaw | Poland | 10000 |
| … | … | … | … | … | … |

After delete

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **id** | **name** | **release\_year** | **rating** | **category\_id** | **publisher\_id** | **players\_range\_id** |
| 2 | Sumatra V2 | 2021 | 7.08 | 4 | 2 | 2 |
| … | … | … | … | … | … | … |
| 15 | Alma Mater | 2018 | 7.68 | 5 | 15 | 5 |
| … | … | … | … | … | … | … |
| 46 | Deep Blue | 2019 | 5.67 | 1 | 15 | 7 |
| … | … | … | … | … | … | … |
| 50 | One Small Step | 2019 | 5.75 | 5 | 9 | 2 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **id** | **name** | **address\_id** | **website** | **phone** |
| 2 | Z-Man Games | 9 | www.zmangames.com | +12165461654 |
| … | … | … | … | … |
| 17 | Amethyst Games | 7 | www.amethystgames.com | +15558889992 |
| 18 | BattleBooks | 13 | www.battlebooks.com | +12345678907 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **id** | **street\_name** | **street\_number** | **town** | **country** | **zip\_code** |
| … | … | … | … | … | … |
| 4 | High Street | 8 | Boston | USA | 68732 |
| 6 | Zaokopowa | 534 | Warsaw | Poland | 10000 |
| … | … | … | … | … | … |

# Section 3. Querying - (40 pts)

**Emily currently needs to extract data, and it's important to note that the sample results in this section are based on a new database. To ensure maximum consistency with the examples provided in this section, it's strongly advised that the database modified by the previous DML problems be cleared and the given "dataset.sql" be re-inserted.**

## Board Games by Release Year

The purpose of this task is to retrieve a list of all board games and sort them in **ascending order** by their **"release\_year"**. If there are multiple games released in the same year, they should be sorted in **descending order** based on their **"name"**. The result set should include only the **"name"** and **"rating"** columns.

### Example

|  |  |
| --- | --- |
| **name** | **rating** |
| Battle Line: Medieval | 7.73 |
| The Castles of Tuscany | 7.39 |
| Santa Monica | 7.54 |
| … | … |
| GOLD | 7.01 |
| Betrayal at Mystery Mansion | 6.89 |

## Board Games by Category

Your task is to write a SQL query that selects all board games with **"Strategy Games"** or **"Wargames"** categories and orders them by their **"release\_year"** in **descending order**. The query should also include the following columns in the output:

* **id**
* **name**
* **release\_year**
* **category\_name**

### Example

|  |  |  |  |
| --- | --- | --- | --- |
| **id** | **name** | **release\_year** | **category\_name** |
| 6 | Polis | 2022 | Wargames |
| 7 | Pan Am | 2022 | Strategy Games |
| 19 | Kemet: Blood and Sand | 2021 | Strategy Games |
| … | … | … | … |
| 28 | Undaunted: North Africa | 2020 | Wargames |
| … | … | … | … |
| 11 | Glasgow | 2018 | Strategy Games |
| 17 | Battle Line: Medieval | 2017 | Strategy Games |

## Creators without Board Games

Write a PostgreSQL query to retrieve all **"creators"** who **don't have any board games** associated with them. The result should be ordered in **ascending order** based on the **creator’s name**. The query should return the following columns:

* **id**
* **creator\_name** (the first and last name of the creator concatenated with a space)
* **email**

### Example

|  |  |  |
| --- | --- | --- |
| **id** | **creator\_name** | **email** |
| 5 | Corey Konieczka | corey@konieczka.com |
| 7 | Jamey Stegmaier | jamey@stegmaier.com |

## First 5 Board Games

Get the initial **5** board games with a **"rating"** higher than **7.00** that either contain the letter **'a'** in the board game **"name"** OR have a **"rating"** greater than **7.50**, and have a player count range between **2** and **5**. Arrange the outcome set by the **board game "name"** in **ascending order**, and by **"rating"** in **descending order** in the case of multiple games having the same name. The necessary columns are:

* **name**
* **rating**
* **category\_name**

### Example

|  |  |  |
| --- | --- | --- |
| **name** | **rating** | **category\_name** |
| Abandon All Artichokes | 7.12 | Family Games |
| Alma Mater | 7.68 | Strategy Games |
| Ankh: Gods of Egypt | 7.20 | Strategy Games |
| Azul: Summer Pavilion | 7.83 | Abstract Games |
| Battle Line: Medieval | 7.73 | Strategy Games |

## Creators with Emails

Retrieve the **full name**, **email**, and **highest-rated** board game for **creators** whose email ends in **".com"**. Sort the result set in **ascending order** by the creator's **full name**. Required columns:

**• full\_name**

**• email**

**• rating**

### Example

|  |  |  |
| --- | --- | --- |
| **full\_name** | **email** | **rating** |
| Alexander Pfister | alexander@pfister.com | 8.58 |
| Bruno Cathala | bruno@cathala.com | 8.58 |
| Emerson Matsuuchi | emerson@matsuuchi.com | 8.60 |

## Creators by Rating

Write an SQL query to select the **last name**, **average rating** (rounded up to the next biggest integer), and **publisher's name** for all creators who have created a board game. Only show results for creators whose games are published by **"Stonemaier Games"**. Sort the results by **"average\_rating"** in **descending order**.

### Example

|  |  |  |
| --- | --- | --- |
| **last\_name** | **average\_rating** | **publisher\_name** |
| Leacock | 9 | Stonemaier Games |
| Matsuuchi | 9 | Stonemaier Games |
| Cathala | 8 | Stonemaier Games |
| Pfister | 8 | Stonemaier Games |
| Rosenberg | 8 | Stonemaier Games |

# Section 4. Programmability - (20 pts)

## Creator of Board Games

Write an SQL query to create a user-defined function named **fn\_creator\_with\_board\_games()** that takes the **first name of a board game creator** as a **VARCHAR(30)** input. The function should return the **total number of board games** created by the input creator.

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

### Example

|  |  |
| --- | --- |
| **Query** | **Output** |
| **SELECT fn\_creator\_with\_board\_games('Bruno')** | **13** |
| **SELECT fn\_creator\_with\_board\_games('Alexander')** | **19** |

## Search for Board Games

### As part of your task, you need to create a stored procedure called usp\_search\_by\_category(). This procedure will have a parameter called "category", which can have a maximum length of 50 characters. The purpose of this procedure is to retrieve detailed information about all board games belonging to the specified category. The information to be displayed includes the game's "name", "release\_year", "rating", "category\_name", publisher’s "name", "min\_players", and "max\_players". To indicate the player counts, append the string " people" at the end. The results should be sorted in ascending order based on the "publisher\_name". If a publisher has multiple games, then the results should be sorted in descending order based on the "release\_year".

**\*\*\*** 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. Before creating the procedure, itself, execute the subsequent SQL query to create the **"search\_results"** table:

**CREATE TABLE search\_results (**

**id SERIAL PRIMARY KEY,**

**name VARCHAR(50),**

**release\_year INT,**

**rating FLOAT,**

**category\_name VARCHAR(50),**

**publisher\_name VARCHAR(50),**

**min\_players VARCHAR(50),**

**max\_players 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\_search\_by\_category('Wargames')**  **SELECT \* FROM search\_results;** | | |
|  | | |
| **Output** | | | | |
| **name** | Verdun 1916: Steel Inferno | Brief Border Wars | Undaunted: North Africa | Polis |
| **release\_year** | 2020 | 2020 | 2020 | 2022 |
| **rating** | 8.60 | 7.54 | 8.09 | 8.58 |
| **category\_name** | Wargames | Wargames | Wargames | Wargames |
| **publisher\_name** | Gamewright | Lookout Games | Stronghold Games | Zczech Games Edition |
| **min\_players** | 4 people | 3 people | 4 people | 3 people |
| **max\_players** | 5 people | 3 people | 4 people | 4 people |