Final Project: Advanced SQL Techniques

Estimated time needed: **60** minutes

Objectives

After completing this lab, you will be able to:

1. Use joins to query data from multiple tables
2. Create and query views
3. Write and run stored procedures
4. Use transactions

Scenario

In this project, you will work with three datasets that are available on the City of Chicago's Data Portal:

- Socioeconomic indicators in Chicago
- Chicago public schools
- Chicago crime data

You must download each dataset, create a table for each one, and load the appropiate dataset through the Db2 console. If you have already completed the Hands on Lab: Joins, you can reuse the tables you created for that hands-on lab. However, you should not reuse similar tables with other names from other exercises or labs, as they may not create the correct results.

Important note:

If you have **not** yet downloaded the three datasets from the City of Chicago's Data Portal, created the required tables, and loaded the data, please follow the instructions in this section.

City of Chicago Datasets

1. **Socioeconomic indicators in Chicago**

This dataset contains a selection of six socioeconomic indicators of public health significance and a “hardship index,” for each Chicago community area, for the years 2008 – 2012. A detailed description of this dataset and the original dataset can be obtained from the Chicago Data Portal at: https://data.cityofchicago.org/Health-Human-Services/Census-Data-Selected-socioeconomic-indicators-in-C/kn9c-c2s2

2. **Chicago public schools**

This dataset shows all school level performance data used to create CPS School Report Cards for the 2011-2012 school year. A detailed description of this dataset and the original dataset can be obtained from the Chicago Data Portal at: https://data.cityofchicago.org/Education/Chicago-Public-Schools-Progress-Report-Cards-2011-/9xs2-f89t

3. **Chicago crime data**

This dataset reflects reported incidents of crime (with the exception of murders where data exists for each victim) that occurred in the City of Chicago from 2001 to present, minus the most recent seven days. A detailed description of this dataset and the original dataset can be obtained from the Chicago Data Portal at: https://data.cityofchicago.org/Public-Safety/Crimes-2001-to-present/ijzp-q8t2

Store the datasets in database tables

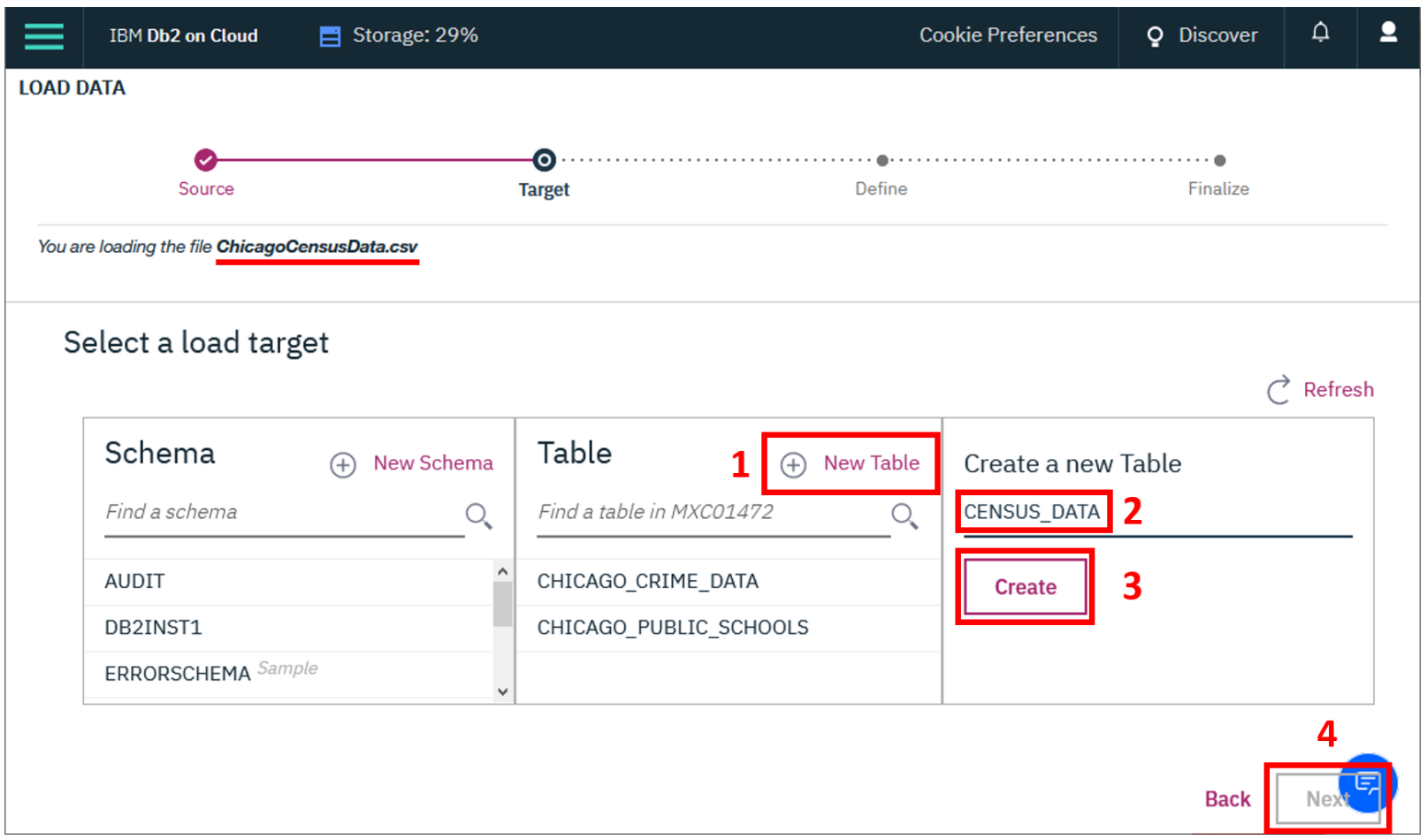
The lab requires you to have these three tables populated with a subset of the whole datasets. Download the 'ChicagoCensusData.csv', 'ChicagoPublicSchools.csv', and 'ChicagoCrimeData.csv' datasets below and load the data into your Db2 On Cloud database.

Chicago Census Data

Chicago Public Schools

Chicago Crime Data

You need to create a new table for each dataset. As you load each dataset, click on "(+) New Table", specify the name of the table you want to create, and then click "Next".



Name the new tables as follows:

1. **CENSUS_DATA**
2. **CHICAGO_PUBLIC_SCHOOLS**
3. **CHICAGO_CRIME_DATA**

After you have created the tables, review the data in each table by using the View Data feature in the Db2 On Cloud console.

Exercise 1: Using Joins

You have been asked to produce some reports about the communities and crimes in the Chicago area. You will need to use SQL join queries to access the data stored across multiple tables.

Question 1

- Write and execute a SQL query to list the school names, community names and average attendance for communities with a hardship index of 98.

▶ Hint 1
▶ Hint 2

Take a screenshot showing the SQL query and its results.

Question 2

- Write and execute a SQL query to list all crimes that took place at a school. Include case number, crime type and community name.

▶ Hint 1
▶ Hint 2
▶ Hint 3

Take a screenshot showing the SQL query and its results.

Exercise 2: Creating a View

For privacy reasons, you have been asked to create a view that enables users to select just the school name and the icon fields from the CHICAGO_PUBLIC_SCHOOLS table. By providing a view, you can ensure that users cannot see the actual scores given to a school, just the icon associated with their score. You should define new names for the view columns to obscure the use of scores and icons in the original table.

Question 1

- Write and execute a SQL statement to create a view showing the columns listed in the following table, with new column names as shown in the second column.

Column name in CHICAGO_PUBLIC_SCHOOLS	Column name in view
NAME_OF_SCHOOL	School_Name
Safety_Icon	Safety_Rating
Family_Involvement_Icon	Family_Rating
Environment_Icon	Environment_Rating
Instruction_Icon	Instruction_Rating
Leaders_Icon	Leaders_Rating
Teachers_Icon	Teachers_Rating

- Write and execute a SQL statement that returns all of the columns from the view.
- Write and execute a SQL statement that returns just the school name and leaders rating from the view.

Take a screenshot showing the last SQL query and its results.

Exercise 3: Creating a Stored Procedure

The icon fields are calculated based on the value in the corresponding score field. You need to make sure that when a score field is updated, the icon field is updated too. To do this, you will write a stored procedure that receives the school id and a leaders score as input parameters, calculates the icon setting and updates the fields appropriately.

Question 1

- Write the structure of a query to create or replace a stored procedure called UPDATE_LEADERS_SCORE that takes a in_School_ID parameter as an integer and a in_Leader_Score parameter as an integer. Don't forget to use the #SET TERMINATOR statement to use the @ for the CREATE statement terminator.

Take a screenshot showing the SQL query.

Question 2

- Inside your stored procedure, write a SQL statement to update the Leaders_Score field in the CHICAGO_PUBLIC_SCHOOLS table for the school identified by in_School_ID to the value in the in_Leader_Score parameter.

Take a screenshot showing the SQL query.

Question 3

- Inside your stored procedure, write a SQL IF statement to update the Leaders_Icon field in the CHICAGO_PUBLIC_SCHOOLS table for the school identified by in_School_ID using the following information.

Score lower limit	Score upper limit	Icon
80	99	Very strong
60	79	Strong
40	59	Average
20	39	Weak

Score lower limit	Score upper limit	Icon
0	19	Very weak

▶ Hint 1

▶ Hint 2

Take a screenshot showing the SQL query.

Question 4

- Run your code to create the stored procedure.

Take a screenshot showing the SQL query and its results.

- Write a query to call the stored procedure, passing a valid school ID and a leader score of 50, to check that the procedure works as expected.

Exercise 4: Using Transactions

You realise that if someone calls your code with a score outside of the allowed range (0-99), then the score will be updated with the invalid data and the icon will remain at its previous value. There are various ways to avoid this problem, one of which is using a transaction.

Question 1

- Update your stored procedure definition. Add a generic ELSE clause to the IF statement that rolls back the current work if the score did not fit any of the preceding categories.

▶ Hint 1

Take a screenshot showing the SQL query.

Question 2

- Update your stored procedure definition again. Add a statement to commit the current unit of work at the end of the procedure.

▶ Hint 1

Take a screenshot showing the SQL query.

- Run your code to replace the stored procedure.
- Write and run one query to check that the updated stored procedure works as expected when you use a valid score of 38.
- Write and run another query to check that the updated stored procedure works as expected when you use an invalid score of 101.

Summary

You can now write advanced SQL statements to query data from multiple tables, to obscure sensitive data from users, and to control how information is updated in your tables.

Authors

[Lin Joyner](optional link to profile)

[Ramesh Sannareddy](optional link to profile)

Other Contributor

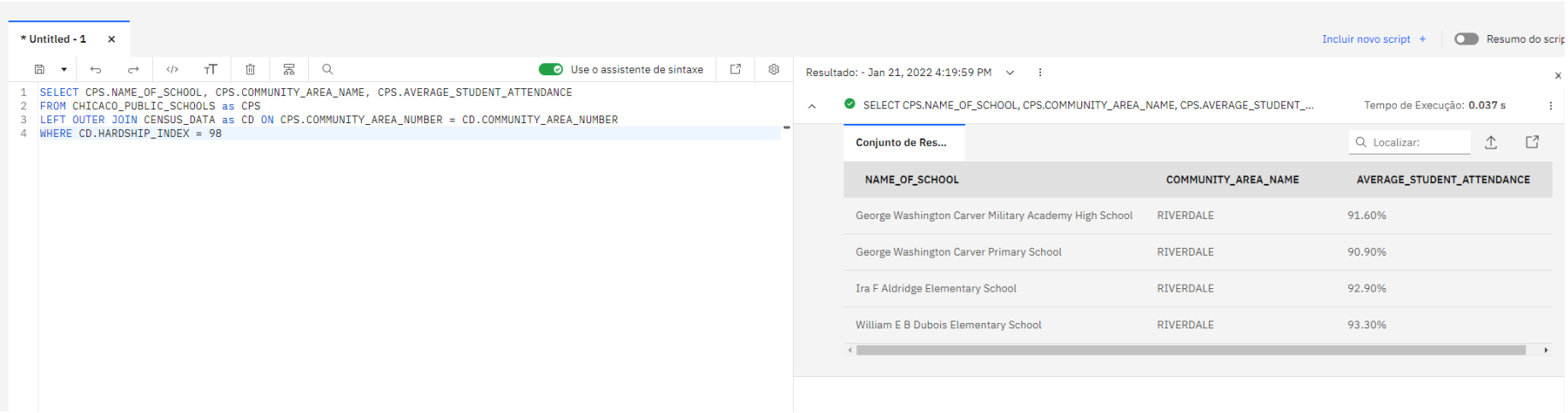
Rose Malcolm

Changelog

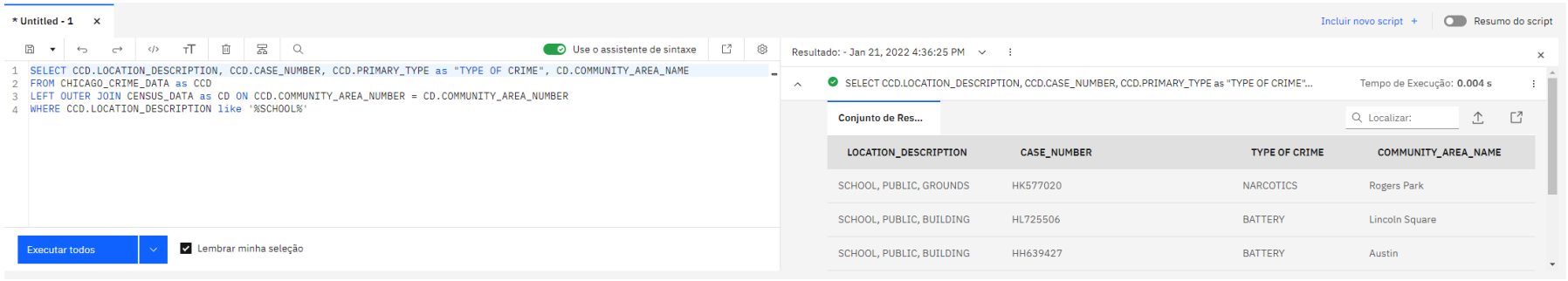
Date	Version	Changed by	Change Description
02-July-21	1.2	Lakshmi Holla	Made changes in Hint section.
27-Jan-21	1.1	Rose Malcolm	Added instructions to go to Exercise 1 if tables already created and poplulated.
05-Jun-20	1.0	Rose Malcolm	Initial version created

EX1 Q1

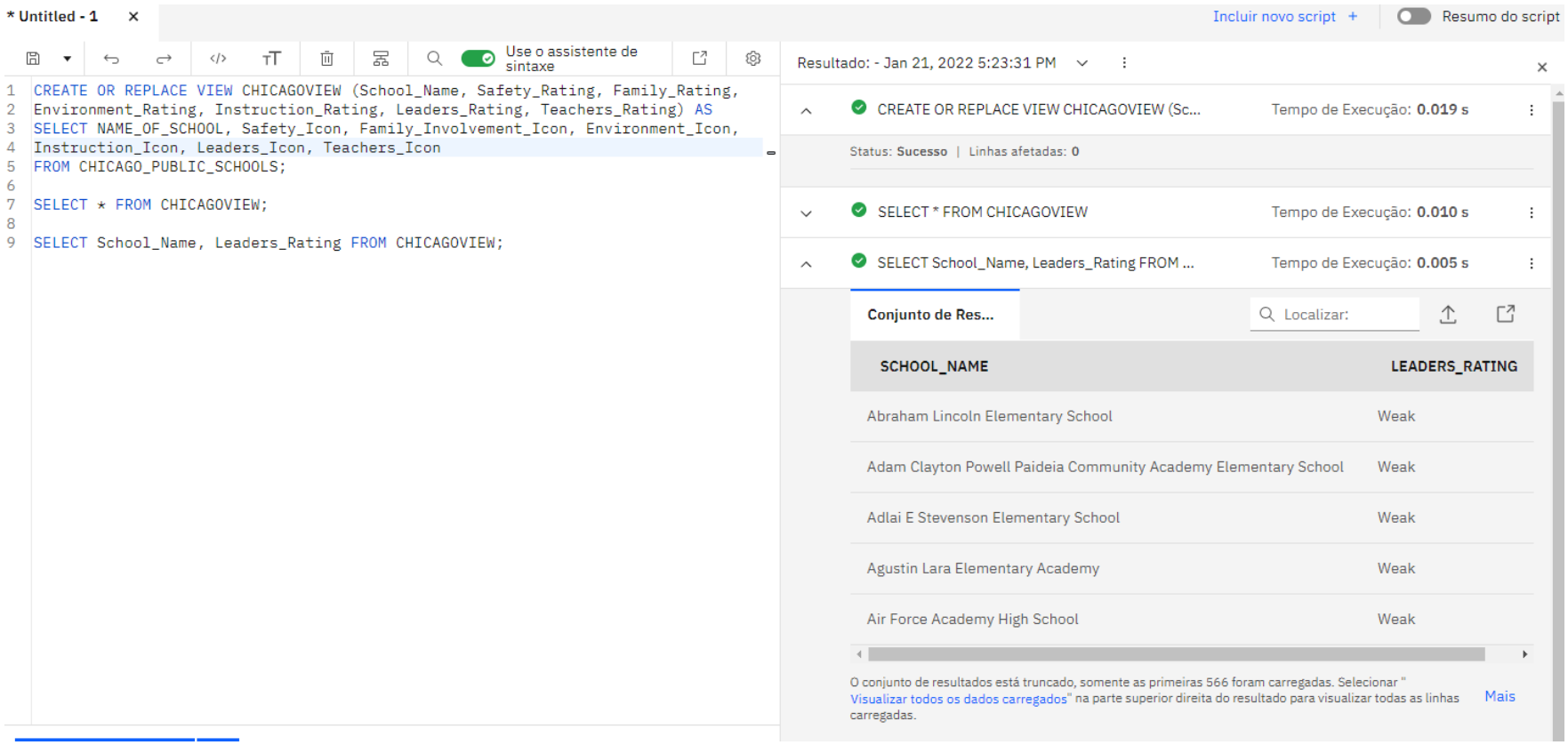
Executar SQL



EX1 Q2



EX2 Q1


* Untitled - 1
Incluir novo script +
Resumo do script
Use o assistente de sintaxe
1 CREATE OR REPLACE VIEW CHICAGOVIEW (School_Name, Safety_Rating, Family_Rating,
2 Environment_Rating, Instruction_Rating, Leaders_Rating, Teachers_Rating) AS
3 SELECT NAME_OF_SCHOOL, Safety_Icon, Family_Involvement_Icon, Environment_Icon,
4 Instruction_Icon, Leaders_Icon, Teachers_Icon
5 FROM CHICAGO_PUBLIC_SCHOOLS;
6
7 SELECT * FROM CHICAGOVIEW;
8
9 SELECT School_Name, Leaders_Rating FROM CHICAGOVIEW;
Resultado: - Jan 21, 2022 5:23:31 PM
CREATE OR REPLACE VIEW CHICAGOVIEW (Sc...
Tempo de Execução: 0.019 s
Status: Sucesso | Linhas afetadas: 0
SELECT * FROM CHICAGOVIEW
Tempo de Execução: 0.010 s
SELECT School_Name, Leaders_Rating FROM ...
Tempo de Execução: 0.005 s
Conjunto de Res...
Localizar:
SCHOOL_NAME
LEADERS_RATING
Abraham Lincoln Elementary School
Weak
Adam Clayton Powell Paideia Community Academy Elementary School
Weak
Adlai E Stevenson Elementary School
Weak
Agustin Lara Elementary Academy
Weak
Air Force Academy High School
Weak
O conjunto de resultados está truncado, somente as primeiras 566 foram carregadas. Selecionar "Visualizar todos os dados carregados" na parte superior direita do resultado para visualizar todas as linhas carregadas.
Mais

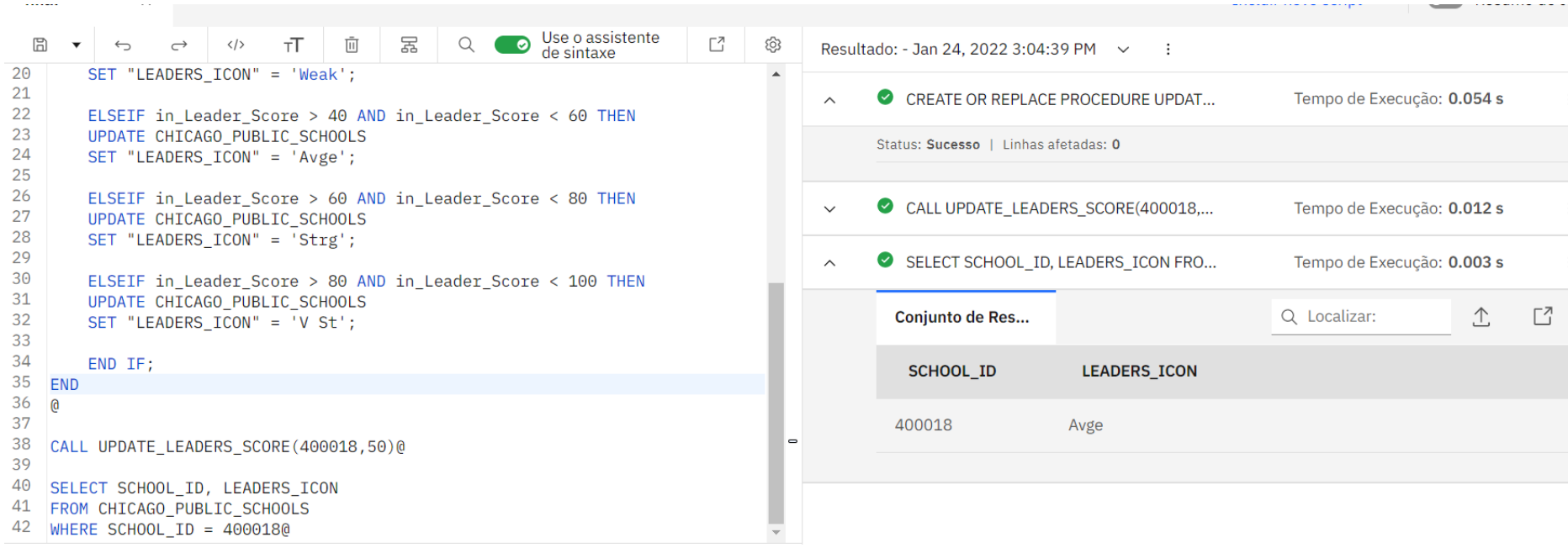
EX3 Q1

```
--#SET TERMINATOR @
CREATE OR REPLACE PROCEDURE UPDATE_LEADERS_SCORE
    (IN in_School_ID INTEGER, IN in_Leader_Score INTEGER)

LANGUAGE SQL
MODIFIES SQL DATA

BEGIN

    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_SCORE" = in_Leader_Score
    WHERE "SCHOOL_ID" = in_School_ID;

    IF in_Leader_Score > 0 AND in_Leader_Score < 20 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'VW';

    ELSEIF in_Leader_Score > 20 AND in_Leader_Score < 40 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'Weak';

    ELSEIF in_Leader_Score > 40 AND in_Leader_Score < 60 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'Avge';

    ELSEIF in_Leader_Score > 60 AND in_Leader_Score < 80 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'Strg';

    ELSEIF in_Leader_Score > 80 AND in_Leader_Score < 100 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'V St';

    END IF;
END
@
```

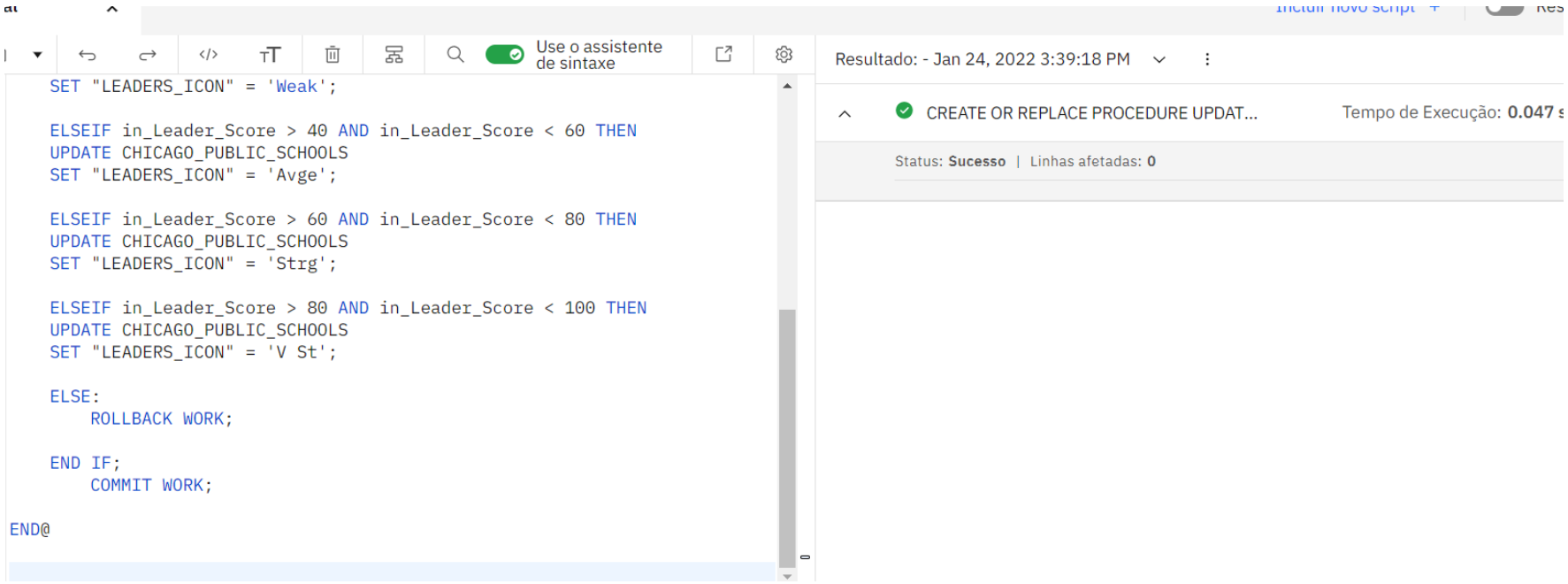
CREATE OR REPLACE PROCEDURE UPDATE_LEADERS_SCORE (IN in_School_ID I... Tempo de Execução: **0.042 s**

Status: **Sucesso** | Linhas afetadas: **0**

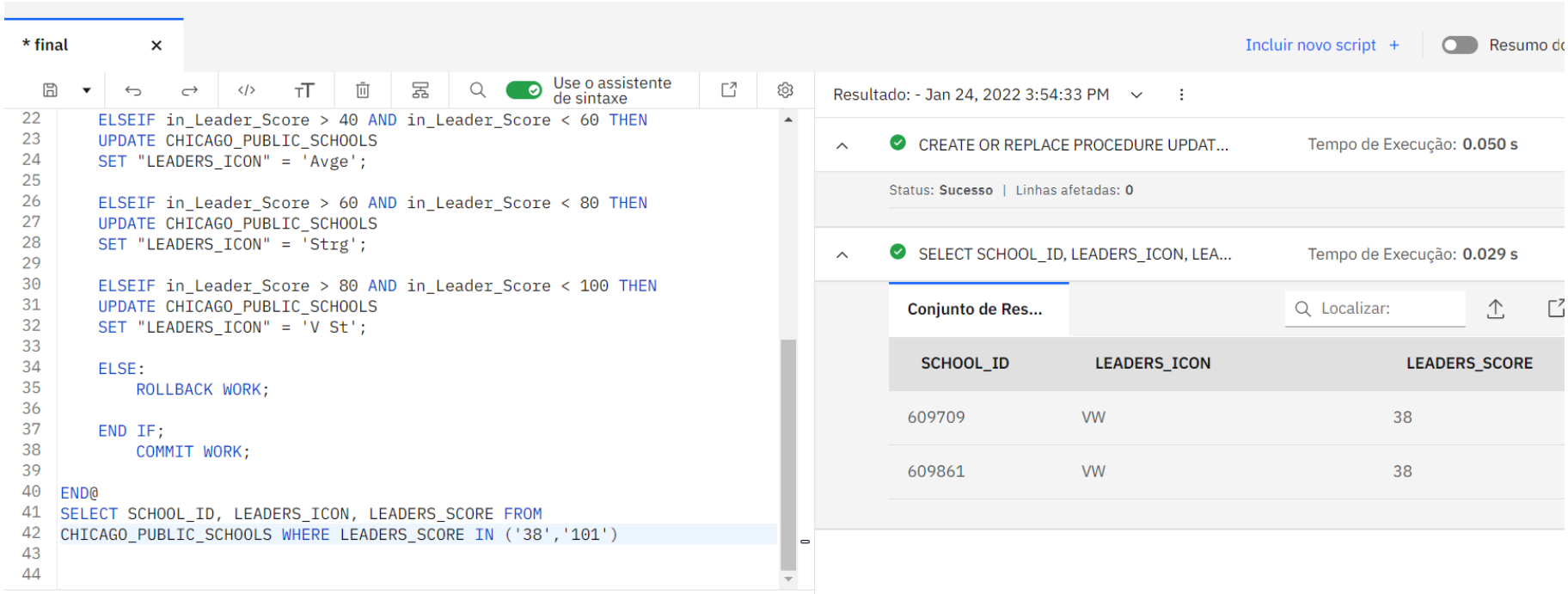
EX3 Q2


Use o assistente de sintaxe
20 SET "LEADERS_ICON" = 'Weak';
21
22 ELSEIF in_Leader_Score > 40 AND in_Leader_Score < 60 THEN
23 UPDATE CHICAGO_PUBLIC_SCHOOLS
24 SET "LEADERS_ICON" = 'Avge';
25
26 ELSEIF in_Leader_Score > 60 AND in_Leader_Score < 80 THEN
27 UPDATE CHICAGO_PUBLIC_SCHOOLS
28 SET "LEADERS_ICON" = 'Strg';
29
30 ELSEIF in_Leader_Score > 80 AND in_Leader_Score < 100 THEN
31 UPDATE CHICAGO_PUBLIC_SCHOOLS
32 SET "LEADERS_ICON" = 'V St';
33
34 END IF;
35 END
36 @
37
38 CALL UPDATE_LEADERS_SCORE(400018,50)@
39
40 SELECT SCHOOL_ID, LEADERS_ICON
41 FROM CHICAGO_PUBLIC_SCHOOLS
42 WHERE SCHOOL_ID = 400018@
Resultado: - Jan 24, 2022 3:04:39 PM
CREATE OR REPLACE PROCEDURE UPDAT...
Tempo de Execução: 0.054 s
Status: Sucesso | Linhas afetadas: 0
CALL UPDATE_LEADERS_SCORE(400018,...
Tempo de Execução: 0.012 s
SELECT SCHOOL_ID, LEADERS_ICON FRO...
Tempo de Execução: 0.003 s
Conjunto de Res...
Localizar:
SCHOOL_ID
LEADERS_ICON
400018
Avge

EX4 Q1


Use o assistente de sintaxe
SET "LEADERS_ICON" = 'Weak';
ELSEIF in_Leader_Score > 40 AND in_Leader_Score < 60 THEN
UPDATE CHICAGO_PUBLIC_SCHOOLS
SET "LEADERS_ICON" = 'Avge';
ELSEIF in_Leader_Score > 60 AND in_Leader_Score < 80 THEN
UPDATE CHICAGO_PUBLIC_SCHOOLS
SET "LEADERS_ICON" = 'Strg';
ELSEIF in_Leader_Score > 80 AND in_Leader_Score < 100 THEN
UPDATE CHICAGO_PUBLIC_SCHOOLS
SET "LEADERS_ICON" = 'V St';
ELSE:
ROLLBACK WORK;
END IF;
COMMIT WORK;
END@
Resultado: - Jan 24, 2022 3:39:18 PM
CREATE OR REPLACE PROCEDURE UPDAT...
Tempo de Execução: 0.047
Status: Sucesso | Linhas afetadas: 0

EX4 Q2




```
    ELSEIF in_Leader_Score > 40 AND in_Leader_Score < 60 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'Avge';

    ELSEIF in_Leader_Score > 60 AND in_Leader_Score < 80 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'Strg';

    ELSEIF in_Leader_Score > 80 AND in_Leader_Score < 100 THEN
    UPDATE CHICAGO_PUBLIC_SCHOOLS
    SET "LEADERS_ICON" = 'V St';

    ELSE:
        ROLLBACK WORK;

    END IF;
        COMMIT WORK;

END@
SELECT SCHOOL_ID, LEADERS_ICON, LEADERS_SCORE FROM
CHICAGO_PUBLIC_SCHOOLS WHERE LEADERS_SCORE IN ('38','101')
```