# COMP 306: Database Management Systems

## Spring 2023 - Homework #3

Use the ‘middle.js,’ ‘server.js, ‘q2.html’, and ‘q4.html' files to solve the questions below. In all questions, we will use the same dataset that we used in the previous homework (named world.sql). If you changed the dataset while doing the previous homework, please delete your copy first and re-populate it from scratch using the version we are providing in this HW.

**Question 1.** [10 pts] (GUI not necessary for this question)

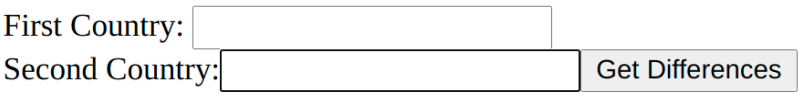
Implement the **contains**(**val**, **col_name**, **table_name**) function inside server.js. This function checks whether the **table_name** table contains any tuple with a cell value equal to **val** in the **col_name** column. According to this, the function returns True or False.

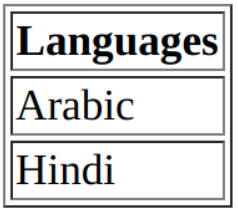
Example evaluations:

- **contains**(**“AFK,” “countryCode”**, **“city”**) should return False.
- **contains**(**“AFG”**, **“countryCode”**, **“city”**) should return True.

**Question 2.** [20 pts]

(a) Design an Input-Output GUI (your GUI should be in q2.html) similar to the following (first one is for input; second one is for output):




(b) Implement the **diff_lang(country1, country2)** function in the files server.js and middle.js. You should:

1. Read user inputs from the above GUI in middle.js and send a request to server.js for further processing.
2. Find the languages that are spoken in **country1** but not in **country2**. This should be done in server.js.
3. Print these languages to the above GUI as output. This should be done in middle.js.

You can use the examples from the PS to see how the link between server.js and middle.js should be established.

Important: Your **diff_lang** implementation MUST use a NESTED SQL QUERY. You are not allowed to write more than one query.

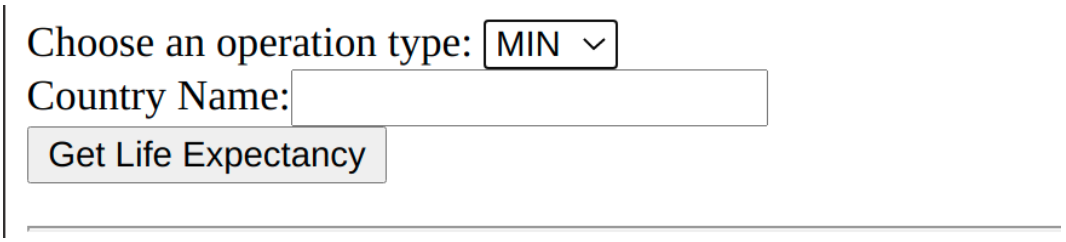
Example evaluations:

- **diff_lang(“Turkey”, “United Arab Emirates”)**: In our database, the languages spoken in Turkey are “Arabic”, “Kurdish”, “Turkish”. The languages spoken in the United Arab Emirates are “Arabic” and “Hindi”. The result must be “Kurdish” and “Turkish”.
- **diff_lang(“Turkey”, “United Kingdom”)**: The result must be “Arabic”, “Kurdish”, “Turkish”.

**Question 3.** [20 pts] Implement the **diff_lang_join(country1, country2)** function inside server.js and middle.js. To receive user’s inputs and display the output, you should implement a GUI that is identical to Question 2.

**diff_lang_join** should return the same result as **diff_lang** in Question 2, but this time, you are **NOT** allowed to use nested SQL queries and/or keywords such as EXCEPT, IN, EXISTS, NOT IN, NOT EXISTS. Instead, you must use JOIN operations. Also, you are not allowed to write more than one query.

**Question 4.** [20 pts]
(a) Design an Input-Output GUI (your GUI should be in q4.html) similar to the following (first one is for input; second one is for output):




| Name | LifeExpectancy | GovernmentForm | Language |
|---|---|---|---|
| Afghanistan | 45.9 | Islamic Emirate | Dari |
| Afghanistan | 45.9 | Islamic Emirate | Pashto |
| Armenia | 66.4 | Republic | Armenian |
| Antigua and Barbuda | 70.5 | Constitutional Monarchy | English |

(b) Implement the **aggregate_countries(agg_type, country_name)** function inside server.js and middle.js. You should:

1. Read user inputs from the above GUI in middle.js and send a request to server.js for further processing.
2. Find the countries that have higher life expectancy than **agg_type** life expectancy of all countries and lower life expectancy than **country_name.** This should be done in server.js.

3. Print the Name, Life Expectancy, Government Type and Official Language of such countries to the GUI as output. This should be done in middle.js.

Similar to Question 2, you can use the examples from the PS to see how the link between server.js and middle.js should be established.

Among the aggregate operators, you only need to consider **agg_type** = **MIN** or **AVG**.

Example evaluations:

- **aggregate_countries**(“**AVG**”, “**Turkey**”) returns countries which have higher life expectancy than **average** life expectancy of all countries and lower life expectancy than **Turkey**.

| Name | LifeExpectancy | GovernmentForm | Language |
|---|---|---|---|
| Antigua and Barbuda | 70.5 | Constitutional Monarchy | English |
| Bulgaria | 70.9 | Republic | Bulgariana |
| Belarus | 68.0 | Republic | Belorussian |
| Belarus | 68.0 | Republic | Russian |
| Belize | 70.9 | Constitutional Monarchy | English |
| Colombia | 70.3 | Republic | Spanish |
| Cape Verde | 68.9 | Republic | Portuguese |
| Algeria | 69.7 | Republic | Arabic |
| Estonia | 69.5 | Republic | Estonian |
| Fiji Islands | 67.9 | Republic | Fijian |
| Greenland | 68.1 | Part of Denmark | Danish |
| Greenland | 68.1 | Part of Denmark | Greenlandic |
| Honduras | 69.9 | Republic | Spanish |
| Indonesia | 68.0 | Republic | Malay |
| Iran | 69.7 | Islamic Republic | Persian |
| Iraq | 66.5 | Republic | Arabic |
| Saint Kitts and Nevis | 70.7 | Constitutional Monarchy | English |
| Lithuania | 69.1 | Republic | Lithuanian |
| Latvia | 68.4 | Republic | Latvian |
| Morocco | 69.1 | Constitutional Monarchy | Arabic |
| Mongolia | 67.3 | Republic | Mongolian |
| Malaysia | 70.8 | Constitutional Monarchy, Federation | Malay |
| Nicaragua | 68.7 | Republic | Spanish |
| Peru | 70.0 | Republic | Aimará |
| Peru | 70.0 | Republic | Ketśua |
| Peru | 70.0 | Republic | Spanish |
| Philippines | 67.5 | Republic | Pilipino |
| Palau | 68.6 | Republic | English |
| Palau | 68.6 | Republic | Palau |
| North Korea | 70.7 | Socialistic Republic | Korean |
| Romania | 69.9 | Republic | Romani |
| Romania | 69.9 | Republic | Romanian |
| Russian Federation | 67.2 | Federal Republic | Russian |
| Saudi Arabia | 67.8 | Monarchy | Arabic |
| El Salvador | 69.7 | Republic | Spanish |
| Seychelles | 70.4 | Republic | English |
| Seychelles | 70.4 | Republic | French |
| Syria | 68.5 | Republic | Arabic |
| Thailand | 68.6 | Constitutional Monarchy | Thai |
| Tonga | 67.9 | Monarchy | English |
| Tonga | 67.9 | Monarchy | Tongan |
| Vietnam | 69.3 | Socialistic Republic | Vietnamese |
| Samoa | 69.2 | Parlementary Monarchy | English |
| Samoa | 69.2 | Parlementary Monarchy | Samoan |

- **aggregate_countries**(“**MIN**”, “**France**”) returns countries which have higher life expectancy than **minimum** life expectancy of all countries and lower life expectancy than **France**.

| Name | LifeExpectancy | GovernmentForm | Language |
|---|---|---|---|
| Aruba | 78.4 | Nonmetropolitan Territory of The Netherlands | Dutch |
| Afghanistan | 45.9 | Islamic Emirate | Dari |
| Afghanistan | 45.9 | Islamic Emirate | Pashto |
| Anguilla | 76.1 | Dependent Territory of the UK | English |
| Albania | 71.6 | Republic | Albaniana |
| Netherlands Antilles | 74.7 | Nonmetropolitan Territory of The Netherlands | Dutch |
| Netherlands Antilles | 74.7 | Nonmetropolitan Territory of The Netherlands | Papiamento |
| United Arab Emirates | 74.1 | Emirate Federation | Arabic |
| Argentina | 75.1 | Federal Republic | Spanish |
| Armenia | 66.4 | Republic | Armenian |
| American Samoa | 75.1 | US Territory | English |
| American Samoa | 75.1 | US Territory | Samoan |
| Antigua and Barbuda | 70.5 | Constitutional Monarchy | English |
| Austria | 77.7 | Federal Republic | German |
| Azerbaijan | 62.9 | Federal Republic | Azerbaijani |
| Burundi | 46.2 | Republic | French |
| Burundi | 46.2 | Republic | Kirundi |
| Belgium | 77.8 | Constitutional Monarchy, Federation | Dutch |
| Belgium | 77.8 | Constitutional Monarchy, Federation | French |
| Belgium | 77.8 | Constitutional Monarchy, Federation | German |
| Bangladesh | 60.2 | Republic | Bengali |
| Bulgaria | 70.9 | Republic | Bulgariana |
| Bahrain | 73.0 | Monarchy (Emirate) | Arabic |
| Bosnia and Herzegovina | 71.5 | Federal Republic | Serbo-Croatian |
| Belarus | 68.0 | Republic | Belorussian |
| Belarus | 68.0 | Republic | Russian |
| Belize | 70.9 | Constitutional Monarchy | English |
| Bermuda | 76.9 | Dependent Territory of the UK | English |
| Bolivia | 63.7 | Republic | Aimará |
| Bolivia | 63.7 | Republic | Ketšua |
| Bolivia | 63.7 | Republic | Spanish |
| Brazil | 62.9 | Federal Republic | Portuguese |
| Barbados | 73.0 | Constitutional Monarchy | English |
| Brunei | 73.6 | Monarchy (Sultanate) | Malay |
| Bhutan | 52.4 | Monarchy | Dzongkha |
| Chile | 75.7 | Republic | Spanish |
| China | 71.4 | People'sRepublic | Chinese |
| Cook Islands | 71.1 | Nonmetropolitan Territory of New Zealand | Maori |
| Colombia | 70.3 | Republic | Spanish |
| Comoros | 60.0 | Republic | Comorian |
| Cape Verde | 68.9 | Republic | Portuguese |
| Costa Rica | 75.8 | Republic | Spanish |
| Cuba | 76.2 | Socialistic Republic | Spanish |
| Cyprus | 76.7 | Republic | Greek |
| Cyprus | 76.7 | Republic | Turkish |
| Czech Republic | 74.5 | Republic | Czech |
| Germany | 77.4 | Federal Republic | German |
| Djibouti | 50.8 | Republic | Arabic |
| Denmark | 76.5 | Constitutional Monarchy | Danish |

**Question 5.** [30 pt] (GUI not necessary for this question)

(a) Implement the **find_min_max_continent()** function inside server.js. This function should find the name of the countries that have minimum and maximum life expectancy in each continent.

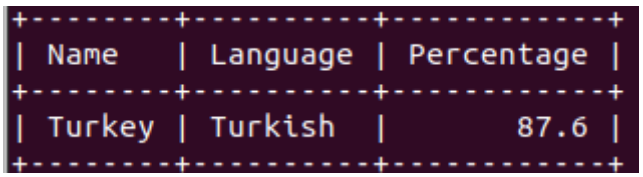
Example evaluation:

| Name | Continent | LifeExpectancy |
|---|---|---|
| Afghanistan | Asia | 45.9 |
| Andorra | Europe | 83.5 |
| Australia | Oceania | 79.8 |
| Brazil | South America | 62.9 |
| Canada | North America | 79.4 |
| French Guiana | South America | 76.1 |
| Haiti | North America | 49.2 |
| Kiribati | Oceania | 59.8 |
| Macao | Asia | 81.6 |
| Moldova | Europe | 64.5 |
| Saint Helena | Africa | 76.8 |
| Zambia | Africa | 37.2 |

(b) Implement the **find_country_languages(percentage, language)** function in server.js. This function should find the names of the countries that speak the **language** with more than **percentage** percent.

Example evaluations:

- **find_country_language(85, "Turkish")** returns countries in which more than 85% of the citizens speak Turkish.

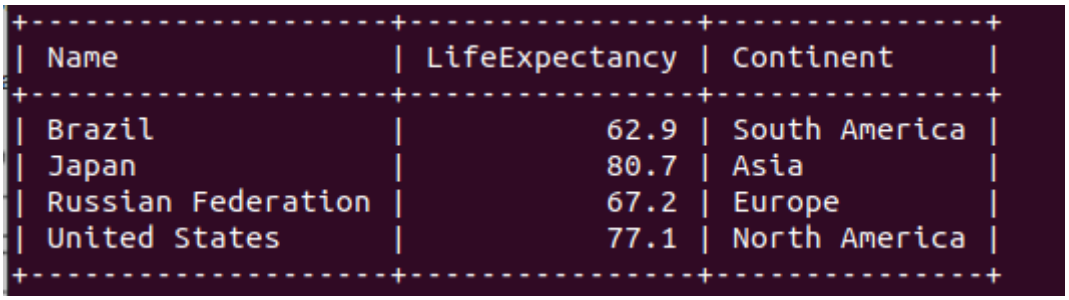


| Name | Language | Percentage |
|---|---|---|
| Turkey | Turkish | 87.6 |

(c) Implement the **find_country_count(amount)** function inside server.js. This function should find the following: Let ***T*** denote the list of countries that have more than **amount** cities. For each continent, find which country among those in ***T*** has the maximum life expectancy in that continent. Print the name of the country that was found, the maximum life expectancy, and the continent.

Example evaluations:

- **find_country_count(100)** should return the following result:



| Name | LifeExpectancy | Continent |
|---|---|---|
| Brazil | 62.9 | South America |
| Japan | 80.7 | Asia |
| Russian Federation | 67.2 | Europe |
| United States | 77.1 | North America |

## Submission

Your submission should consist of all of your JS and HTML files, zipped as: **'<your_student_ID>.zip'**.