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CS 348 - Homework 7: Data Warehousing (HIVE and BigQuery).
(40 Points)

Fall 2020
Due on: **12/1/2020 at 11:59 pm**
This assignment is to be completed by individuals. You should only talk to the instructor, and the TAs about this assignment. You may also post questions (and not answers) to Campuswire.

There will be a 10% penalty if the homework is submitted 24 hours after the due date, a 15% penalty if the homework is submitted 48 hours after the due date, or a 20% penalty if the homework is submitted 72 hours after the due date. The homework will not be accepted after 72 hours, as a solution will be posted by then.

Submission Instruction: Write your answers in this document. Create a pdf and upload to Gradescope.

For questions 1 and 2, consider the us_cities.csv file included with this homework (this file does not include column headers). us_cities_sample.csv includes the column headers and only a few rows. The create-table statement can be found in createTable.sql.

For more information about HIVE and BigQuery, including the supported SQL clauses, you can visit the HIVE and BigQuery documentation.
https://cwiki.apache.org/confluence/display/Hive/LanguageManual

https://cloud.google.com/bigquery/docs/reference/standard-sql/query-syntax

Question 1) (10 points)
Using HIVE, list each state along with its population. The population of a state is the total population of its cities. Sort your result by population in a descending order.

Write your answer (query) and insert a screenshot of your result (partial result is sufficient). Your screenshot should show the HIVE command prompt.

Expected Result:

```
+-----------------------+-----------+
|      state_name       | totalPop  |
+-----------------------+-----------+
| California            | 59608877  |
| New York              | 37847876  |
| Texas                 | 33020438  |
| Florida               | 30243610  |
| Illinois              | 18266059  |
| Pennsylvania          | 15641201  |
| Ohio                  | 13764673  |
| Georgia               | 10750970  |
| Michigan              | 10429997  |
| Washington            | 10134988  |
| Arizona               | 9581518   |
| North Carolina        | 9203228   |
| Massachusetts         | 8972816   |
| Virginia              | 8197045   |
| Colorado              | 7499152   |
| Missouri              | 7463356   |
| Minnesota             | 7275566   |
| Maryland              | 6880970   |
| Indiana               | 6161106   |
```

……

OUTPUT is TRIMMED

SELECT state_name, SUM(population) AS totalPop

FROM cities2

GROUP BY state_name

ORDER BY totalPop DESC;

```
0: jdbc:hive2://localhost:10000/default> SELECT state_name, SUM(population) AS totalPop
. . . . . .> FROM cities2
. . . . . .> GROUP BY state_name
. . . . . .> ORDER BY totalPop DESC;
+-----------------------+-----------+
|       state_name      | totalpop  |
+-----------------------+-----------+
| California            | 59608877  |
| New York              | 37847876  |
| Texas                 | 33020438  |
| Florida               | 30243610  |
| Illinois              | 18266059  |
| Pennsylvania          | 15641201  |
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| Virginia              | 8197045   |
| Colorado              | 7499152   |
| Missouri              | 7463356   |
| Minnesota             | 7275566   |
| Maryland              | 6880970   |
| Indiana               | 6161106   |
| Tennessee             | 6065103   |
| Wisconsin             | 5936025   |
| New Jersey            | 5697038   |
| District of Columbia  | 5289420   |
| Oregon                | 5212252   |
| Louisiana             | 4894945   |
| Utah                  | 4854868   |
| South Carolina        | 4530198   |
| Nevada                | 4434080   |
| Alabama               | 4299420   |
| Connecticut           | 4072787   |
| Oklahoma              | 3657380   |
| Kentucky              | 3287922   |
| Iowa                  | 3167941   |
| Arkansas              | 2608972   |
| Kansas                | 2586907   |
| New Mexico            | 2102495   |
| Mississippi           | 2076480   |
| Puerto Rico           | 1940742   |
| Nebraska              | 1885071   |
| Hawaii                | 1839050   |
| Rhode Island          | 1653103   |
| Idaho                 | 1632041   |
| West Virginia         | 1375886   |
| Montana               | 816367    |
| New Hampshire         | 799613    |
| North Dakota          | 727244    |
| Alaska                | 695791    |
| South Dakota          | 678953    |
| Maine                 | 616831    |
| Delaware              | 557808    |
| Wyoming               | 487683    |
| Vermont               | 258863    |
| FL                    | NULL      |
| state_name            | NULL      |
+-----------------------+-----------+
54 rows selected (10.97 seconds)
```

Question 2, HIVE) (15 points)

The explode command in HIVE can be used to flatten complex data types, such as maps and arrays. See the following example of Explode in the HIVE documentation: https://cwiki.apache.org/confluence/display/Hive/LanguageManual+LateralView

Using explode to flatten the zips column in the cities data set, find the highest zip code in the US. Write your query and insert a screenshot of your result. Your screenshot should show the HIVE command prompt.

Expected Result:

```
+-------------+
| highestzip  |
+-------------+
| 99950       |
+-------------+
```

SELECT MAX(blownzips) as highestZip

FROM cities2 LATERAL VIEW explode(zips) adTable AS blownzips;

```
0: jdbc:hive2://localhost:10000/default> SELECT MAX(blownzips) as highestZip
. . . . . . . . . . . . . . . . . . .> FROM cities2 LATERAL VIEW explode(zips) adTable AS blownzips;
+-------------+
| highestzip  |
+-------------+
| 99950       |
+-------------+
1 row selected (25.136 seconds)
```

Question 3) (5 points)

What is the MongoDB operator that is similar to Explode in HIVE?

The mongoDB function similar to explode in Hive is the $unwind operator.

Question 3, BigQuery) (10 points)

Choose a public data set in BigQuery and write two queries. Insert screenshots of your queries and results (partial results are sufficient).

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BigQuery

Query editor

```
SELECT
  COUNT(tree_id) count,
  tree_id,
  STRING_AGG(DISTINCT title) movies
FROM
  `bigquery-public-data.san_francisco_trees.street_trees` t
JOIN
  `bigquery-public-data.san_francisco_film_locations.film_locations` f
ON
  f.locations = t.address
GROUP BY
  tree_id, f.locations
ORDER BY
  tree_id ASC
```

This query will process 4.7 MB when run.

Query results

Query complete (0.7 sec elapsed, 4.7 MB processed)

Row	count	tree_id	movies
1	1	29050	Bitter Melon
2	1	29051	Bitter Melon
3	2	31413	Quitters
4	2	31414	Quitters

Rows per page: 100 1 - 46 of 46

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BigQuery

Query editor

```
SELECT
  COUNT(locations) count,
  title,
FROM
  `bigquery-public-data.san_francisco_film_locations.film_locations` f
GROUP BY
  title, f.locations
ORDER BY
  count DESC
```

This query will process 162.4 KB when run.

Query results

Query complete (0.4 sec elapsed, 162.4 KB processed)

Row	count	title
1	6	Groove
2	4	A View to a Kill
3	4	San Andreas
4	2	A Jitney Elopement

Rows per page: 100 1 - 100 of 1819