ISTE-230 Introduction to Database & Data Modeling

## Homework #8 – Relational Algebra, Subqueries, and Joins

DUE:

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Submit your script to the HW 8 Assignment folder by the deadline.**

Needed to complete: MySQL version 8

In this assignment you will utilize the JOBS database to explore the use of relational algebra, subqueries, and joins within MySQL. This exploration will help you to formulate strategies for query composition when a specified set of data needs to be found within a database.

Download and install the ‘jobs’ database

In MyCourses you will find a script called ‘createJobs.sql’. Download the file to your local hard drive. Run the ‘createJobs.sql’ script within MySQL to create the ‘jobs’ database.

Familiarize yourself with the structure of the ‘jobs’ database by examining the ‘createJobs.sql’ script as well as reviewing the information provided in appendix A.

Query the database

Create a script called ‘*yourlastname*\_HW8.sql’ and add a comment at the top of the file with your name. For each question you will add a comment indicating the task number, followed by your SQL statement that addresses the task, given the specification provided. The results you should achieve are shown after each task (if your records appear in a different order but the content is the same, that is fine).

1. Write a SQL statement that will accomplish the equivalent of the following theoretical relational algebra statement: (EMPLOYER[stateCode]) + (QUARTER[location]).

+-----------+

| stateCode |

+-----------+

| AL |

| CA |

| CO |

| CT |

| FL |

| GA |

| MA |

| MI |

| NJ |

| NV |

| NY |

| OH |

| PA |

| SC |

| TX |

| VA |

+-----------+

16 rows in set (0.00 sec)

1. Write a SQL statement that will accomplish the equivalent of a theoretical relational algebra equijoin between employer and interview with a projection of companyName, division, stateCode, and salaryOffered. (Hint: Make sure you are joining on the entire primary key/foreign key relationship.)

+------------------------------+------------------+-----------+---------------+

| companyName | division | stateCode | salaryOffered |

+------------------------------+------------------+-----------+---------------+

| Acme Information Source | Customer Support | OH | 20.00 |

| Braddock Information Assoc. | Payroll | MA | 18.75 |

| Ajax Software, Inc. | Production | CA | 19.00 |

| Ajax Software, Inc. | RandD | CA | 19.50 |

| Bay Software Inc. | Production | CA | 19.75 |

| Vegas Programming and Design | Development | NV | 19.00 |

| Mountainside Magic Software | Management | CO | 19.50 |

| Mountainside Magic Software | Customer Support | CO | 18.75 |

| Cameron Industries | Management | TX | 21.25 |

| Cameron Industries | Customer Support | TX | 21.00 |

| CCC Software | Production | NY | 19.50 |

| DC Security Applications | RandD | VA | 19.50 |

| Davis-Klein Software | RandD | NY | 19.25 |

| Flordia Software Designs | RandD | FL | 19.75 |

| Rochester Software Design | Development | NY | 20.00 |

| Focused Applications, Inc. | Production | SC | 20.00 |

| Georgia Software Design | RandD | GA | 19.75 |

| ApplDesign | RandD | AL | 19.50 |

| Long Island Apps, Inc. | Development | NY | 20.25 |

| Jersey Computer Services | Customer Support | NJ | 20.50 |

| Flordia Software Designs | Development | FL | 20.75 |

| Manhattan-Made Software | Customer Support | NY | 20.50 |

| Manhattan-Made Software | Payroll | NY | 21.25 |

| Nantucket Applications, Inc. | RandD | MA | 21.00 |

| PennState Programming, Inc. | Management | PA | 21.00 |

| Sandy Shore Software | Development | CT | 20.75 |

| Buffalo Software Assoc. | Payroll | NY | 20.75 |

| Virginia Software Industries | Production | VA | 21.75 |

+------------------------------+------------------+-----------+---------------+

28 rows in set (0.00 sec)

1. Write a SQL statement that accomplishes the equivalent of the following theoretical relational algebra statement: STATE-EMPLOYER.

+-----------+--------------------------------+

| stateCode | description |

+-----------+--------------------------------+

| AK | ALASKA |

| AR | ARKANSAS |

| AS | AMERICAN SAMOA |

| AZ | ARIZONA |

| DC | DISTRICT OF COLUMBIA |

| DE | DELAWARE |

| FM | FEDERATED STATES OF MICRONESIA |

| GU | GUAM |

| HI | HAWAII |

| IA | IOWA |

| ID | IDAHO |

| IL | ILLINOIS |

| IN | INDIANA |

| KS | KANSAS |

| KY | KENTUCKY |

| LA | LOUISIANA |

| MD | MARYLAND |

| ME | MAINE |

| MH | MARSHALL ISLANDS |

| MN | MINNESOTA |

| MO | MISSOURI |

| MP | NORTHERN MARIANA ISLANDS |

| MS | MISSISSIPPI |

| MT | MONTANA |

| NC | NORTH CAROLINA |

| ND | NORTH DAKOTA |

| NE | NEBRASKA |

| NH | NEW HAMPSHIRE |

| NM | NEW MEXICO |

| OK | OKLAHOMA |

| OR | OREGON |

| PR | PUERTO RICO |

| PW | PALAU |

| RI | RHODE ISLAND |

| SD | SOUTH DAKOTA |

| TN | TENNESSEE |

| UT | UTAH |

| VI | VIRGIN ISLANDS |

| VT | VERMONT |

| WA | WASHINGTON |

| WI | WISCONSIN |

| WV | WEST VIRGINIA |

| WY | WYOMING |

+-----------+--------------------------------+

43 rows in set (0.00 sec)

1. Write a SQL statement that performs the equivalent of the following theoretical relational algebra statement: INTERVIEW[companyName, minHrsOffered].

+------------------------------+---------------+

| companyName | minHrsOffered |

+------------------------------+---------------+

| Acme Information Source | 40 |

| Braddock Information Assoc. | 40 |

| Ajax Software, Inc. | 40 |

| Bay Software Inc. | 20 |

| Vegas Programming and Design | 40 |

| Mountainside Magic Software | 20 |

| Mountainside Magic Software | 40 |

| Cameron Industries | 35 |

| CCC Software | 40 |

| DC Security Applications | 30 |

| Davis-Klein Software | 20 |

| Flordia Software Designs | 30 |

| Rochester Software Design | 30 |

| Focused Applications, Inc. | 30 |

| Georgia Software Design | 40 |

| ApplDesign | 30 |

| Long Island Apps, Inc. | 40 |

| Jersey Computer Services | 35 |

| Manhattan-Made Software | 40 |

| Nantucket Applications, Inc. | 40 |

| PennState Programming, Inc. | 40 |

| Sandy Shore Software | 35 |

| Buffalo Software Assoc. | 35 |

| Virginia Software Industries | 40 |

+------------------------------+---------------+

24 rows in set (0.00 sec)

1. Write a SQL statement that accomplishes a theoretical relational algebra selection from the state table that includes all of the tuples/records that have ‘a’, ‘e’, ‘i’, ‘o’, or ‘u’ as the third letter of the description.

+-----------+----------------+

| stateCode | description |

+-----------+----------------+

| AK | ALASKA |

| AL | ALABAMA |

| AS | AMERICAN SAMOA |

| AZ | ARIZONA |

| FL | FLORIDA |

| GA | GEORGIA |

| GU | GUAM |

| ID | IDAHO |

| LA | LOUISIANA |

| ME | MAINE |

| OH | OHIO |

| OR | OREGON |

| PR | PUERTO RICO |

| RI | RHODE ISLAND |

| SC | SOUTH CAROLINA |

| SD | SOUTH DAKOTA |

| UT | UTAH |

| WY | WYOMING |

+-----------+----------------+

18 rows in set (0.00 sec)

1. Write a SQL statement that will show the quarter code, location, and state description for locations in the quarter table that also are found in state.

+---------+----------+---------------+

| qtrCode | location | description |

+---------+----------+---------------+

| 20173 | CA | CALIFORNIA |

| 20183 | MA | MASSACHUSETTS |

| 20171 | NY | NEW YORK |

| 20181 | NY | NEW YORK |

| 20184 | NY | NEW YORK |

+---------+----------+---------------+

5 rows in set (0.00 sec)

1. Write a SQL statement that will show the description for ALL states as well as the companynames of employers located each state.

+--------------------------------+--------------------------------+

| description | companyName |

+--------------------------------+--------------------------------+

| ALASKA | NULL |

| ALABAMA | ApplDesign |

| ARKANSAS | NULL |

| AMERICAN SAMOA | NULL |

| ARIZONA | NULL |

| CALIFORNIA | Ajax Software, Inc. |

| CALIFORNIA | Ajax Software, Inc. |

| CALIFORNIA | Bay Software Inc. |

| CALIFORNIA | Bay Software Inc. |

| COLORADO | Mountainside Magic Software |

| COLORADO | Mountainside Magic Software |

| CONNECTICUT | Sandy Hook Software |

| DISTRICT OF COLUMBIA | NULL |

| DELAWARE | NULL |

| FLORIDA | Flordia Software Designs |

| FLORIDA | Flordia Software Designs |

| FEDERATED STATES OF MICRONESIA | NULL |

| GEORGIA | Georgia Software Design |

| GUAM | NULL |

| HAWAII | NULL |

| IOWA | NULL |

| IDAHO | NULL |

| ILLINOIS | NULL |

| INDIANA | NULL |

| KANSAS | NULL |

| KENTUCKY | NULL |

| LOUISIANA | NULL |

| MASSACHUSETTS | Braddock Information Assoc. |

| MASSACHUSETTS | Nantucket Applications, Inc. |

| MARYLAND | NULL |

| MAINE | NULL |

| MARSHALL ISLANDS | NULL |

| MICHIGAN | Michigan Application Design |

| MINNESOTA | NULL |

| MISSOURI | NULL |

| NORTHERN MARIANA ISLANDS | NULL |

| MISSISSIPPI | NULL |

| MONTANA | NULL |

| NORTH CAROLINA | NULL |

| NORTH DAKOTA | NULL |

| NEBRASKA | NULL |

| NEW HAMPSHIRE | NULL |

| NEW JERSEY | Jersey Computer Services |

| NEW MEXICO | NULL |

| NEVADA | Vegas Programming and Design |

| NEW YORK | Buffalo Software Assoc. |

| NEW YORK | CCC Software |

| NEW YORK | Davis-Klein Software |

| NEW YORK | Long Island Apps, Inc. |

| NEW YORK | Manhattan-Made Software |

| NEW YORK | Manhattan-Made Software |

| NEW YORK | Midtown Software Development |

| NEW YORK | Rochester Application Software |

| NEW YORK | Rochester Software Design |

| NEW YORK | Western New York Applications |

| NEW YORK | Yankee Software |

| NEW YORK | Yankee Software |

| NEW YORK | Yankee Software |

| OHIO | Acme Information Source |

| OKLAHOMA | NULL |

| OREGON | NULL |

| PENNSYLVANIA | PennState Programming, Inc. |

| PENNSYLVANIA | PSWD, Inc. |

| PUERTO RICO | NULL |

| PALAU | NULL |

| RHODE ISLAND | NULL |

| SOUTH CAROLINA | Focused Applications, Inc. |

| SOUTH DAKOTA | NULL |

| TENNESSEE | NULL |

| TEXAS | Cameron Industries |

| TEXAS | Cameron Industries |

| UTAH | NULL |

| VIRGINIA | DC Security Applications |

| VIRGINIA | Virginia Software Industries |

| VIRGIN ISLANDS | NULL |

| VERMONT | NULL |

| WASHINGTON | NULL |

| WISCONSIN | NULL |

| WEST VIRGINIA | NULL |

| WYOMING | NULL |

+--------------------------------+--------------------------------+

80 rows in set (0.00 sec)

**Appendix A – Information on JOBS database structure and content**

mysql> DESCRIBE quarter;

+---------+------------------+------+-----+-------+------+

| Field | Type | Null | Key |Default|Extra |

+---------+------------------+------+-----+-------+------+

| qtrCode | varchar(5) | NO | PRI | | |

| location| char(2) | YES | MUL | NULL | |

| minSal | decimal(6,2) | NO | | NULL | |

| minHrs | tinyint unsigned | NO | | NULL | |

+---------+------------------+------+-----+-------+------+

4 rows in set (0.01 sec)

mysql> DESCRIBE employer;

+-------------+-------------+------+-----+---------+-------+

| Field | Type | Null | Key | Default | Extra |

+-------------+-------------+------+-----+---------+-------+

| companyName | varchar(30) | NO | PRI | NULL | |

| division | varchar(30) | NO | PRI | NULL | |

| address | varchar(30) | YES | | NULL | |

| city | varchar(20) | YES | | NULL | |

| stateCode | char(2) | NO | MUL | NULL | |

| zipCode | varchar(10 | YES | | NULL | |

+-------------+-------------+------+-----+---------+-------+

6 rows in set (0.01 sec)

mysql> DESCRIBE state;

+-------------+-------------+------+-----+---------+-------+

| Field | Type | Null | Key | Default | Extra |

+-------------+-------------+------+-----+---------+-------+

| stateCode | char(2) | NO | PRI | | |

| description | varchar(30) | NO | | NULL | |

+-------------+-------------+------+-----+---------+-------+

2 rows in set (0.01 sec)

mysql> DESCRIBE interview;

+---------------+------------------+----+---+-------+------+

| Field | Type |Null|Key|Default|Extra |

+---------------+------------------+----+---+-------+------+

| interviewID | int unsigned | NO |PRI| 0 | |

| interviewDate | date | YES| | NULL | |

| companyName | varchar(30) | NO |MUL| NULL | |

| division | varchar(30) | NO | | NULL | |

| qtrCode | varchar(5) | YES|MUL| NULL | |

| salaryOffered | decimal(8,2) | YES| | NULL | |

| minHrsOffered | tinyint unsigned | YES| | NULL | |

| listing | enum('y','n') | YES| | NULL | |

| jobDesc | varchar(255) | YES| | NULL | |

+---------------+------------------+----+---+-------+------+

9 rows in set (0.01 sec)

mysql> SELECT \* FROM employer;

+--------------------------------+------------------+---------------------------+------------------+-----------+---------+

| companyName | division | address | city | stateCode | zipCode |

+--------------------------------+------------------+---------------------------+------------------+-----------+---------+

| Acme Information Source | Customer Support | 132 Commerical Way | Cleveland | OH | 44234 |

| Ajax Software, Inc. | Production | 2421 West Industrial Way | Berkeley | CA | 94710 |

| Ajax Software, Inc. | RandD | 2421 West Industrial Way | Berkeley | CA | 94710 |

| ApplDesign | RandD | 3 Mapleview Drive | Huntsville | AL | 35803 |

| Bay Software Inc. | Production | 4223 Halster Way | Berkeley | CA | 94710 |

| Bay Software Inc. | RandD | 4223 Halster Way | Berkeley | CA | 94710 |

| Braddock Information Assoc. | Payroll | 1 Washington Complex | Boston | MA | 2101 |

| Buffalo Software Assoc. | Payroll | 45511 Delaware Ave. | Buffalo | NY | 14221 |

| Cameron Industries | Customer Support | 3112 West Helm Street | Kingwood | TX | 77339 |

| Cameron Industries | Management | 3112 West Helm Street | Kingwood | TX | 77339 |

| CCC Software | Production | 41 Golem Terrace | New York | NY | 10012 |

| Davis-Klein Software | RandD | 8871 West Grange Drive | Cairo | NY | 12413 |

| DC Security Applications | RandD | 1602 Jackson Ave. | Arlington | VA | 22202 |

| Flordia Software Designs | Development | 45A Sturgeon Dr., Bldg. 5 | Ft. Pierce | FL | 34951 |

| Flordia Software Designs | RandD | 45A Sturgeon Dr., Bldg. 5 | Ft. Pierce | FL | 34951 |

| Focused Applications, Inc. | Production | 776 West Ninth St. | Myrtle Beach | SC | 29579 |

| Georgia Software Design | RandD | 6665 Peachtree Lane | Atlanta | GA | 30328 |

| Jersey Computer Services | Customer Support | 44 WhiteStallion Pike | Lindenwold | NJ | 8021 |

| Long Island Apps, Inc. | Development | 67 Merrifield Ave. | Oceanside | NY | 11572 |

| Manhattan-Made Software | Customer Support | 35 West 9th St. | New York | NY | 10012 |

| Manhattan-Made Software | Payroll | 35 West 9th St. | New York | NY | 10012 |

| Michigan Application Design | Development | 5531 E. Lansing Ave. | Ypsilanti | MI | 48197 |

| Midtown Software Development | Customer Support | 7554 West 9th St. | New York | NY | 10003 |

| Mountainside Magic Software | Customer Support | 4 Rocky Way | Colorado Springs | CO | 80941 |

| Mountainside Magic Software | Management | 4 Rocky Way | Colorado Springs | CO | 80941 |

| Nantucket Applications, Inc. | RandD | 45521 Pilgrim Circle | Nantucket | MA | 2554 |

| PennState Programming, Inc. | Management | 3 Carnegie Circle | Pittsburgh | PA | 15108 |

| PSWD, Inc. | Management | 15 Carnegie Circle | Pittsburgh | PA | 15108 |

| Rochester Application Software | Production | 16 Broad Street | Rochester | NY | 14621 |

| Rochester Software Design | Development | 16 Broad Street | Rochester | NY | 14621 |

| Sandy Shore Software | Development | 5665 MassPike Circle | Waterford | CT | 6482 |

| Vegas Programming and Design | Development | 3 Desert Trail | Las Vegas | NV | 89117 |

| Virginia Software Industries | Production | 3 Confederate Ave. | Roanoke | VA | 24010 |

| Western New York Applications | RandD | 44 Rockman Blvd. | Rochester | NY | 14623 |

| Yankee Software | Development | 1 Braddock Circle | Kenmore | NY | 14223 |

| Yankee Software | Management | 1 Braddock Circle | Kenmore | NY | 14223 |

| Yankee Software | RandD | 1 Braddock Circle | Kenmore | NY | 14223 |

+--------------------------------+------------------+---------------------------+------------------+-----------+---------+

37 rows in set (0.00 sec)

mysql> SELECT \* FROM interview;

+-----------+-------------+----------------------------+----------------+-------+-------------+-------------+-------+--------+

|interviewID|interviewCate|companyName |division |qtrCode|salaryOffered|minHrsOffered|listing|jobDesc |

+-----------+-------------+----------------------------+----------------+-------+-------------+-------------+-------+--------+

| 1 | 2017-06-01 |Acme Information Source |Customer Support| 20171 | 20.00 | 40 | y |Job Desc|

| 2 | 2017-06-01 |Braddock Information Assoc. |Payroll | 20171 | 18.75 | 40 | n |Job Desc|

| 3 | 2017-06-30 |Ajax Software, Inc. |Production | 20171 | 19.00 | 40 | y |Job Desc|

| 4 | 2017-06-30 |Ajax Software, Inc. |RandD | 20171 | 19.50 | 40 | y |Job Desc|

| 5 | 2017-07-01 |Bay Software Inc. |Production | 20171 | 19.75 | 20 | y |Job Desc|

| 6 | 2017-08-01 |Vegas Programming and Design|Development | 20171 | 19.00 | 40 | n |Job Desc|

| 7 | 2017-08-01 |Mountainside Magic Software |Management | 20171 | 19.50 | 20 | y |Job Desc|

| 8 | 2017-08-02 |Mountainside Magic Software |Customer Support| 20171 | 18.75 | 40 | y |Job Desc|

| 9 | 2017-12-01 |Cameron Industries |Management | 20173 | 21.25 | 35 | n |Job Desc|

| 10 | 2017-12-02 |Cameron Industries |Customer Support| 20173 | 21.00 | 35 | n |Job Desc|

| 11 | 2017-12-04 |CCC Software |Production | 20173 | 19.50 | 40 | n |Job Desc|

| 12 | 2018-01-21 |DC Security Applications |RandD | 20173 | 19.50 | 30 | n |Job Desc|

| 13 | 2018-02-01 |Davis-Klein Software |RandD | 20173 | 19.25 | 20 | n |Job Desc|

| 14 | 2018-02-02 |Flordia Software Designs |RandD | 20173 | 19.75 | 30 | n |Job Desc|

| 15 | 2018-07-01 |Rochester Software Design |Development | 20181 | 20.00 | 30 | n |Job Desc|

| 16 | 2018-07-01 |Focused Applications, Inc. |Production | 20181 | 20.00 | 30 | y |Job Desc|

| 17 | 2018-08-01 |Georgia Software Design |RandD | 20181 | 19.75 | 40 | y |Job Desc|

| 18 | 2018-08-08 |ApplDesign |RandD | 20181 | 19.50 | 30 | y |Job Desc|

| 19 | 2018-08-11 |Long Island Apps, Inc. |Development | 20181 | 20.25 | 40 | y |Job Desc|

| 20 | 2019-01-01 |Jersey Computer Services |Customer Support| 20183 | 20.50 | 35 | n |Job Desc|

| 21 | 2019-01-01 |Flordia Software Designs |Development | 20183 | 20.75 | 30 | n |Job Desc|

| 22 | 2019-01-31 |Manhattan-Made Software |Customer Support| 20183 | 20.50 | 40 | y |Job Desc|

| 23 | 2019-02-01 |Manhattan-Made Software |Payroll | 20183 | 21.25 | 40 | y |Job Desc|

| 24 | 2019-03-24 |Nantucket Applications, Inc.|RandD | 20184 | 21.00 | 40 | y |Job Desc|

| 25 | 2019-03-31 |PennState Programming, Inc. |Management | 20184 | 21.00 | 40 | y |Job Desc|

| 26 | 2019-04-20 |Sandy Shore Software |Development | 20184 | 20.75 | 35 | n |Job Desc|

| 27 | 2019-04-22 |Buffalo Software Assoc. |Payroll | 20184 | 20.75 | 35 | y |Job Desc|

| 28 | 2019-05-01 |Virginia Software Industries|Production | 20184 | 21.75 | 40 | n |Job Desc|

+-----------+-------------+----------------------------+----------------+-------+-------------+-------------+-------+--------+

28 rows in set (0.00 sec)

mysql> SELECT \* FROM state;

+-----------+--------------------------------+

| stateCode | description |

+-----------+--------------------------------+

| AK | ALASKA |

| AL | ALABAMA |

| AR | ARKANSAS |

| AS | AMERICAN SAMOA |

| AZ | ARIZONA |

| CA | CALIFORNIA |

| CO | COLORADO |

| CT | CONNECTICUT |

| DC | DISTRICT OF COLUMBIA |

| DE | DELAWARE |

| FL | FLORIDA |

| FM | FEDERATED STATES OF MICRONESIA |

| GA | GEORGIA |

| GU | GUAM |

| HI | HAWAII |

| IA | IOWA |

| ID | IDAHO |

| IL | ILLINOIS |

| IN | INDIANA |

| KS | KANSAS |

| KY | KENTUCKY |

| LA | LOUISIANA |

| MA | MASSACHUSETTS |

| MD | MARYLAND |

| ME | MAINE |

| MH | MARSHALL ISLANDS |

| MI | MICHIGAN |

| MN | MINNESOTA |

| MO | MISSOURI |

| MP | NORTHERN MARIANA ISLANDS |

| MS | MISSISSIPPI |

| MT | MONTANA |

| NC | NORTH CAROLINA |

| ND | NORTH DAKOTA |

| NE | NEBRASKA |

| NH | NEW HAMPSHIRE |

| NJ | NEW JERSEY |

| NM | NEW MEXICO |

| NV | NEVADA |

| NY | NEW YORK |

| OH | OHIO |

| OK | OKLAHOMA |

| OR | OREGON |

| PA | PENNSYLVANIA |

| PR | PUERTO RICO |

| PW | PALAU |

| RI | RHODE ISLAND |

| SC | SOUTH CAROLINA |

| SD | SOUTH DAKOTA |

| TN | TENNESSEE |

| TX | TEXAS |

| UT | UTAH |

| VA | VIRGINIA |

| VI | VIRGIN ISLANDS |

| VT | VERMONT |

| WA | WASHINGTON |

| WI | WISCONSIN |

| WV | WEST VIRGINIA |

| WY | WYOMING |

+-----------+--------------------------------+

59 rows in set (0.01 sec)

mysql> SELECT \* FROM quarter;

+---------+----------+--------+--------+

| qtrCode | location | minSal | minHrs |

+---------+----------+--------+--------+

| 20171 | NY | 19.00 | 40 |

| 20173 | CA | 19.50 | 30 |

| 20181 | NY | 20.00 | 30 |

| 20183 | MA | 20.75 | 40 |

| 20184 | NY | 21.50 | 40 |

+---------+----------+--------+--------+

5 rows in set (0.00 sec)