



ISTE-230 Introduction to Database & Data Modeling

Homework #8 – Relational Algebra, Subqueries, and Joins

DUE: Monday, April 20, 2020 by 11:59pm

Name: _____

Submit your script to the HW#8 Dropbox by the deadline.

Needed to complete: MySQL version 5

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: $(\text{EMPLOYER}[\text{statecode}]) + (\text{QUARTER}[\text{location}])$.

```
+-----+
| statecode |
+-----+
| AL        |
| CA        |
| CO        |
| CT        |
| FL        |
| GA        |
| MA        |
| MI        |
| NJ        |
| NV        |
| NY        |
| OH        |
| PA        |
| SC        |
| TX        |
| VA        |
+-----+
16 rows in set (0.00 sec)
```



2. 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	12.00
Braddock Information Assoc.	Payroll	MA	10.75
Ajax Software, Inc.	Production	CA	11.00
Ajax Software, Inc.	RandD	CA	11.50
Bay Software Inc.	Production	CA	11.75
Vegas Programming and Design	Development	NV	11.00
Mountainside Magic Software	Management	CO	11.50
Mountainside Magic Software	Customer Support	CO	10.75
Cameron Industries	Management	TX	13.25
Cameron Industries	Customer Support	TX	13.00
CCC Software	Production	NY	11.50
DC Security Applications	RandD	VA	11.50
Davis-Klein Software	RandD	NY	11.25
Flordia Software Designs	RandD	FL	11.75
Rochester Software Design	Development	NY	12.00
Focused Applications, Inc.	Production	SC	12.00
Georgia Software Design	RandD	GA	11.75
ApplDesign	RandD	AL	11.50
Long Island Apps, Inc.	Development	NY	12.25
Jersey Computer Services	Customer Support	NJ	12.50
Flordia Software Designs	Development	FL	12.75
Manhattan-Made Software	Customer Support	NY	12.50
Manhattan-Made Software	Payroll	NY	13.25
Nantucket Applications, Inc.	RandD	MA	13.00
PennState Programming, Inc.	Management	PA	13.00
Sandy Shore Software	Development	CT	12.75
Buffalo Software Assoc.	Payroll	NY	12.75
Virginia Software Industries	Production	VA	13.75

28 rows in set (0.00 sec)



3. 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)



4. 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)



5. 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)
```



6. 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 |
+-----+-----+-----+
| 19953   | CA       | CALIFORNIA  |
| 19963   | MA       | MASSACHUSETTS |
| 19951   | NY       | NEW YORK    |
| 19961   | NY       | NEW YORK    |
| 19964   | NY       | NEW YORK    |
+-----+-----+-----+
5 rows in set (0.00 sec)
```



7. 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	
minsalsal	decimal(6,2)	NO		NULL	
minhrs	tinyint(3) 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	int(5)	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(10) 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(3) 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	interviewdate	companyname	division	qtrcode	salaryoffered	minhrsoffered	listing	jobdesc
1	1995-06-01	Acme Information Source	Customer Support	19951	12.00	40	y	Job Desc
2	1995-06-01	Braddock Information Assoc.	Payroll	19951	10.75	40	n	Job Desc
3	1995-06-30	Ajax Software, Inc.	Production	19951	11.00	40	y	Job Desc
4	1995-06-30	Ajax Software, Inc.	RandD	19951	11.50	40	y	Job Desc
5	1995-07-01	Bay Software Inc.	Production	19951	11.75	20	y	Job Desc
6	1995-08-01	Vegas Programming and Design	Development	19951	11.00	40	n	Job Desc
7	1995-08-01	Mountainside Magic Software	Management	19951	11.50	20	y	Job Desc
8	1995-08-02	Mountainside Magic Software	Customer Support	19951	10.75	40	y	Job Desc
9	1995-12-01	Cameron Industries	Management	19953	13.25	35	n	Job Desc
10	1995-12-02	Cameron Industries	Customer Support	19953	13.00	35	n	Job Desc
11	1995-12-04	CCC Software	Production	19953	11.50	40	n	Job Desc
12	1996-01-21	DC Security Applications	RandD	19953	11.50	30	n	Job Desc
13	1996-02-01	Davis-Klein Software	RandD	19953	11.25	20	n	Job Desc
14	1996-02-02	Flordia Software Designs	RandD	19953	11.75	30	n	Job Desc
15	1996-07-01	Rochester Software Design	Development	19961	12.00	30	n	Job Desc
16	1996-07-01	Focused Applications, Inc.	Production	19961	12.00	30	y	Job Desc
17	1996-08-01	Georgia Software Design	RandD	19961	11.75	40	y	Job Desc
18	1996-08-08	ApplDesign	RandD	19961	11.50	30	y	Job Desc
19	1996-08-11	Long Island Apps, Inc.	Development	19961	12.25	40	y	Job Desc
20	1997-01-01	Jersey Computer Services	Customer Support	19963	12.50	35	n	Job Desc
21	1997-01-01	Flordia Software Designs	Development	19963	12.75	30	n	Job Desc
22	1997-01-31	Manhattan-Made Software	Customer Support	19963	12.50	40	y	Job Desc
23	1997-02-01	Manhattan-Made Software	Payroll	19963	13.25	40	y	Job Desc
24	1997-03-24	Nantucket Applications, Inc.	RandD	19964	13.00	40	y	Job Desc
25	1997-03-31	PennState Programming, Inc.	Management	19964	13.00	40	y	Job Desc
26	1997-04-20	Sandy Shore Software	Development	19964	12.75	35	n	Job Desc
27	1997-04-22	Buffalo Software Assoc.	Payroll	19964	12.75	35	y	Job Desc
28	1997-05-01	Virginia Software Industries	Production	19964	13.75	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
19951	NY	11.00	40
19953	CA	11.50	30
19961	NY	12.00	30
19963	MA	12.75	40
19964	NY	13.50	40

```
5 rows in set (0.00 sec)
```



NAME: _____

Grading Rubric – Homework #8: Relational Algebra, Subqueries, and Joins

GRADE:

Legend:

5	Perfect!
4	Majority is correct
3	Half right
2	Majority is wrong
1	Attempt was made, but very little to count as correct
0	Not done

Question #1

Item	0	1	2	3	4	5	Comments
Statement outputs requested attributes							
Statement outputs records that meet criteria specified							
Statements formulated correctly to use UNION keyword							

Question #2

Item	0	1	2	3	4	5	Comments
Statement outputs requested attributes							
Statement appropriately outputs records that meet criteria specified							
Condition(s) for equijoin is/are correct							

Question #3

Item	0	1	2	3	4	5	Comments
Outer query: Statement outputs requested attributes							
Outer query: Statement outputs records that meet criteria specified							
Subquery: Statement outputs necessary attribute(s)							
Subquery: Statement outputs appropriate records							

Question #4							
Item	0	1	2	3	4	5	Comments
Statement outputs requested attributes							
Statement outputs records that meet criteria specified							
Question #5							
Item	0	1	2	3	4	5	Comments
Statement outputs requested attributes							
Statement appropriately outputs records that meet criteria specified							
Question #6							
Item	0	1	2	3	4	5	Comments
Statement outputs requested attributes							
Statement appropriately outputs records that meet criteria specified							
Question #7							
Item	0	1	2	3	4	5	Comments
Statement outputs requested attributes							
Output shows records from the state table where there are no employers located							
Output shows companyname for employers that are located in the respective state							
Overall							
Item	0	1	2	3	4	5	Comments
Script named properly and appropriate commenting (name at top; task number before answer)							

Overall Comments: