## Homework Assignment Submitted Successfully.

**You obtained a score of 90.0 points, out of a possible 105.0 points.**
**You have answered 6 questions correctly.**
**You have answered 1 question incorrectly.**
**For each correct answer, you received 15.0 points**
**and for each incorrect answer, you lost 0.0 points.**

**Please Try Again.**

| | |
|---|---|
| **Submission number:** | 515439 |
| **Submission certificate:** | HA726192 |
| **Submission time:** | 2020-02-18 18:29:12 PST (GMT - 8:00) |

| | |
|---|---|
| **Number of questions:** | 7 |
| **Positive points per question:** | 15.0 |
| **Negative points per question:** | 0.0 |
| **Your score:** | 90 |

**1.** Suppose relation R(L, M, N) has the tuples:

| L | M | N |
|---|---|---|
| 1 | 1 | 2 |
| 2 | 1 | 1 |
| 2 | 3 | 2 |
| 1 | 1 | 1 |
| 3 | 2 | 1 |
| 1 | 1 | 3 |

Using bag projection and intersection, compute $\Pi_{(L,M)}(R) \cap \varrho_{S(L,M)}(\Pi_{(M,N)}(R))$. Note that the renaming is only to give the two projections the same schema. Which of the following is true about the tuples that appear in the result?

a) (1, 1) appears three times in the result.

b) (3, 2) appears twice in the result.

c) (3, 2) appears once in the result.

d) (1, 2) appears once in the result.

Answer submitted: **c)**

You have answered the question correctly.

**2.** Suppose relation R(A, B, C, D) has the tuples:

| A | B | C | D |
|---|---|---|---|
| 2 | 2 | 3 | 3 |
| 3 | 2 | 4 | 4 |
| 3 | 3 | 5 | 2 |
| 3 | 3 | 2 | 5 |
| 4 | 4 | 3 | 3 |
| 4 | 4 | 4 | 4 |
| 5 | 3 | 5 | 2 |
| 3 | 2 | 2 | 5 |
| 5 | 2 | 3 | 3 |
| 5 | 2 | 4 | 4 |

Using bag projection and difference, compute

$\pi_{A,B}(R) - \varrho_{S(A,B)}(\pi_{C,D}(R))$.

Note that the remaining is only to give the two projections the same schema.

Which of the following is true about the tuples that appear in the result?

a) (3, 2) appears once in the result.

b) (3, 3) appears once in the result.

c) (5, 2) appears once in the result.

d) (2, 2) appears once in the result.

Answer submitted: **d)**

You have answered the question correctly.

**3.** Suppose relation R(a, b, c, d, e) currently has the tuples: R

| a | b | c | d | e |
|---|---|---|---|---|
| 1 | 4 | 3 | 7 | 3 |
| 2 | 1 | 4 | 3 | 3 |
| 5 | 3 | 1 | 2 | 2 |
| 3 | 8 | 5 | 1 | 7 |

Which of the following tuples is in the generalized projection PROJ_{b, d - a, 3 * e}(R)?

a) (1, 1, 9)

b) (4, 2, 9)

c) (4, 6, 6)

d) (3, 3, 4)

Answer submitted: **a)**

You have answered the question correctly.

**4.** Suppose relation R(X, Y, Z) has the tuples:

| | | |
|---|---|---|

| X | Y | Z |
|---|---|---|
| 2 | 6 | 5 |
| 5 | 6 | 1 |
| 9 | 0 | 1 |
| 9 | 0 | 7 |
| 5 | 6 | 5 |

Compute the bag union of the following four expressions, each of which is the bag projection (PI) of a grouping (GAMMA) operation using renaming (RHO):

1. PI_A(RHO_R{X, Y, A}(GAMMA_{X, Y, AVG(Z)}(R)))

2. PI_A(RHO_R{Y, A}(GAMMA_{Y, SUM(Z)}(R)))

3. PI_A(RHO_R{X, A}(GAMMA_{X, MIN(Z)}(R)))

4. PI_A(RHO_R{Y, A}(GAMMA_{Y, MAX(X)}(R)))

Demonstrate that you have computed this bag correctly by identifying, from the list below, the correct count of occurrences for one of the elements.

a) 8 appears exactly three times.

b) 4 appears exactly two times.

c) 5 appears exactly three times.

d) 2 appears exactly once.

Answer submitted: **c)**

You have answered the question correctly.

**5.** Suppose relation R1(L, M) has the tuples:

R1

| L | M |
|---|---|
| 7 | f |
| 3 | d |
| 4 | e |
| 6 | d |
| 1 | a |
| 9 | b |
| 3 | j |

and suppose relation R2(M, N) has the tuples:

R2

| M | N |
|---|---|
| c | 3 |
| d | 2 |
| b | 6 |
| i | 5 |
| e | 3 |

Identify which of the following (L, M, N) tuples can result from the left natural outer-join of R1 and R2.

a) (1, a, null)

b) (null, null, null)

c) (6, d, 3)

d) (1, a, 6)

Answer submitted: **a)**

You have answered the question correctly.

**6.** Here are three relations, R1(m, n), R2(m, n), and R3(m, n). Their current values are:

R1

| m | n |
|---|---|
| a | a |
| a | b |
| b | a |
| b | b |

R2

| m | n |
|---|---|
| a | a |
| a | b |
| b | a |
| b | b |

R3

| m | n |
|---|---|
| a | a |
| a | b |
| b | a |
| b | b |

Compute the result of the following query:

**SELECT R1.m, R1.n, R2.n, R3.n FROM R1, R2, R3 WHERE R1.n = R2.m AND R2.n <> R3.n AND R3.m <> b;**

Identify in the list below the true statement about whether or not a tuple appears in the output and how many times it appears in the output.

a) (b, a, a, b) appears once.

b) (a, b, a, b) appears twice.

c) (b, b, a, b) does not appear.

d) (a, a, a, b) appears twice.

Answer submitted: **a)**

You have answered the question correctly.

**7.** Consider the relational database shown below:

student(studentname, street, city)

study(studentname, universityname, SAT)

university(universityname, city)

tutor(tutorname, personname)

Identify the correct relational algebra expression for the queries shown below.

Assume the following notations:

Π - Projection

∞ - Natural Join

σ - Selection

× - Products

a) Find the names of all students whose SAT score is greater than the SAT score for every student of NC State University. $\Pi_{studentname}$( study) - ($\sigma_{study.studentname}$ (study ∞ $_{study.SAT <=study2.SAT}$) $\varrho_{study2}$(study))

b) Find the names of all students in this database who live in the same city as the university for which they study. $\Pi_{studentname}$ (student ×(study ∞ university))

c) Find the names of all students in this database who live in the same city as the university for which they study. $\sigma_{studentname}$ (student ∞ (study × university))

d) Find the names of all students whose SAT score is greater than the SAT score of every student of NC State University. $\Pi_{studentname}$( study) - ($\Pi_{study.studentname}$( study ∞ $_{study.SAT <= study2.SAT and study2.universityname = "NC State University"}$ $\varrho_{study2}$(study)))

Answer submitted: **c)**

Your answer is incorrect.