Relational Algebra Quiz

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Quiz due May 4, 2022 00:53 IST

Each multiple-choice quiz problem is based on a "root question," from which the system generates different correct and incorrect choices each time you take the quiz. Thus, you can test yourself on the same material multiple times. We strongly urge you to continue testing on each topic until you complete the quiz with a perfect score at least once. Simply click the "Reset" button at the bottom of the page for a new variant of the quiz.

After submitting your selections, the system will score your quiz, and for incorrect answers will provide an "explanation" (sometimes for correct ones too). These explanations should help you get the right answer the next time around. To prevent rapid-fire guessing, the system enforces a minimum of 10 minutes between each submission of solutions.

Q1

1/1 point (graded)

[Q1] Suppose relation R(A,C) has the following tuples:

A	C
3	3
6	4
2	3
3	5
7	1

and relation S(B,C,D) has the following tuples:

B	C	D
5	1	6
1	5	8
4	3	9

Compute the natural join of R and S. Which of the following tuples is in the result? Assume each tuple has schema (A,B,C,D).

- (3, 4, 3, 9)
- (7, 1, 5, 8)
- (2, 3, 1, 6)
- (3, 3, 5, 8)

✔

Problem Explanation

To compute the natural join, we must find tuples from R and S that

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agree on all common attributes. In this case, C is the only attribute appearing in both schemas, and the tuples in the join result have attributes A, B, C, and D -- the union of the attributes from R and S.
Tuple (3,3) from R(A,C) matches (4,3,9) from S(B,C,D), since they both have 3 in their C attributes. The resulting tuple, with schema (A,B,C,D), is (3,4,3,9). Similarly, (2,3) from R(A,B) matches both (4,3,9) from S yielding (2,4,3,9) in the result. R tuples (3,5) and (7,1) match S tuples (1,5,8) and (5,1,6) respectively, yielding result tuples (3,1,5,8) and (7,5,1,6). Tuple (6,4) from R matches nothing from S, so there are no more tuples in the result.

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Answers are displayed within the problem

Q2

1/1 point (graded)
[Q2] Suppose relation R(A,B) has the following tuples:

A	B
1	a
7	t
2	g
4	c
9	t

and relation S(B,C,D) has the following tuples:

B	C	D
c	5	6
a	7	8
t	8	9

Compute the theta-join of R and S with the condition R.B = S.B AND R.A < S.C Which of the following tuples is in the result? Assume each tuple has schema (A, R.B, S.B, C, D).

- (2, g, c, 5, 6)
- (1, a, a, 7, 8) ✔
- (9, t, t, 8, 9)
- (2, g, t, 8, 9)

Problem Explanation
Consider tuple (1,a) from R(A,B). In order for a tuple from S(B,C,D) to satisfy the condition R.B = S.B AND R.A <, we must have B=a AND 1 < C. S tuple (a,7,8) satisfies that condition, so we get

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(1,a,a,7,8) for the join result.
Now consider tuple (7,t) from R. This tuple joins with tuples (t,8,9) from S since t=t and 7 < 8, producing result tuple (7,t,t,8,9).
Similarly, (4,c) from R joins with (c,5,6) from S to produce (4,c,c,5,6).
Tuple (2,g) from R does not join with any tuples from S, since no tuples in S satisfy the condition R.B = S.B. Although tuple (9,t) in R satisfies condition R.B = S.B with tuple (t,8,9) from S, this tuple pair does not satisfy R.A < S.C, so it does not appear in the join result.

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Answers are displayed within the problem

Q3

1/1 point (graded)

[Q3] Consider a relation R(A,B) with r tuples, all unique within R, and a relation S(B,C) with s tuples, all unique within S. Let t represent the number of tuples in R natural-join S. Which of the following triples of values (r,s,t) is possible?

- (1,1,2)
- (5,10,500)
- (2,3,8)
- (5,3,1) ✔

Problem Explanation
R natural-join S has as few as zero tuples (if no B values match) and as many as r times s tuples (if all B values are the same).

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Answers are displayed within the problem

Q4

1/1 point (graded)

[Q4] Consider a relation R(A) with r tuples, all unique within R, and a relation S(A) with s tuples, all unique within S. Let t represent the number of tuples in R minus S. Which of the following triples of values (r,s,t) is possible?

- (10,15,0) ✔
- (8,2,2)
- (5,10,10)

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- (5,10,-5)

✔

Problem Explanation
R minus S has at most r tuples (if no values of R are also in S) and as few as max(r-s,0) tuples (if all values of R are also in S).

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Answers are displayed within the problem

Q5

1/1 point (graded)
[Q5] Suppose relation R(A,B) has the following tuples:

A	B
1	2
3	4
5	6

and relation S(B,C,D) has the following tuples:

B	C	D
2	4	6
4	6	8
4	7	9

Compute the natural join of R and S. Which of the following tuples is in the result? Assume each tuple has schema (A,B,C,D).

- (5,6,7,9)
- (5,6,7,8)
- (1,4,7,9)
- (3,4,7,9)

✔

Problem Explanation
To compute the natural join, we must find tuples from R and S that agree on all common attributes. In this case, B is the only attribute appearing in both schemas, and the tuples in the join result have attributes A, B, C, and D -- the union of the attributes from R and S.
Tuple (1,2) from R(A,B) matches (2,4,6) from S(B,C,D), since they both have 2 in their B attributes. The resulting tuple, with schema (A,B,C,D), is (1,2,4,6). Similarly, (3,4) from R matches both (4,6,8) and (4,7,9) from S, yielding tuples (3,4,6,8) and (3,4,7,9) for the result. Tuple (5,6) from R matches nothing from S, so there are no

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more tuples in the result.

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Answers are displayed within the problem

Q6

1/1 point (graded)

[Q6] Suppose relation R(A,B) has the following tuples:

A	B
1	2
3	4
5	6

and relation S(B,C,D) has the following tuples:

B	C	D
2	4	6
4	6	8
4	7	9

Compute the theta-join of R and S with the condition R.A < S.C AND R.B < S.D. Which of the following tuples is in the result? Assume each tuple has schema (A, R.B, S.B, C, D).

- (3,4,5,7,9)
- (1,2,4,7,9)
- (5,6,2,4,6)
- (5,6,4,6,9)

Problem Explanation

Consider tuple (1,2) from R(A,B). In order for a tuple (b,c,d) from S(B,C,D) to satisfy the condition R.A < S.C AND R.B < S.D, we must have 1 < c AND 2 < d. Each of the three tuples from S satisfy that condition. Thus, we get for the resulting join tuples (1,2,2,4,6), (1,2,4,6,8), and (1,2,4,7,9).

Now consider tuple (3,4) from R. This tuple joins with tuples (b,c,d) from S that satisfy 3 < c AND 4 < d. Again all three tuples from S satisfy this condition and yield three more tuples for the result: (3,4,2,4,6), (3,4,4,6,8), and (3,4,4,7,9).

Finally, consider (5,6) from R. The condition for a successful join is 5 < c AND 6 < d. Tuple (2,4,6) from S(B,C,D) does not satisfy the condition; both 5 < 4 and 6 < 6 are false, in fact. However, (4,6,8) and (4,7,9) do satisfy the condition, yielding two more tuples for the result: (5,6,4,6,8) and (5,6,4,7,9).

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Q7

1/1 point (graded)

[Q7] Suppose relation R(A,B,C) has the following tuples:

A	B	C
1	2	3
4	2	3
4	5	6
2	5	3
1	2	6

Compute the projection $\pi_{C,B}$ (R). Which of the following tuples is in the result?

- (5,3)
- (1,2,6)
- (2,5)
- (6,5) ✔

Problem Explanation

For each tuple in R, take the C (last) component and follow it by the B (middle) component to generate a tuple in the projection result. However, notice that the first two tuples of R both yield the tuple (3,2); this tuple appears only once. Thus the result is {(3,2), (6,5), (3,5), (6,2)}.

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Q8

1/1 point (graded)

[Q8]

Suppose relation R(A,B,C) has the following tuples:

A	B	C
1	2	3
4	2	3
4	5	6

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2	5	3
1	2	6

and relation S(A,B,C) has the following tuples:

A	B	C
2	5	3
2	5	4
4	5	6
1	2	3

Compute the union of R and S. Which of the following tuples DOES NOT appear in the result?

- (2,2,3)
- (2,5,3)
- (2,5,4)
- (1,2,3)

✔

Problem Explanation
Each tuple that is in R, S, or both, is in the union. These tuples are (1,2,3), (4,2,3), (4,5,6), (2,5,3), (1,2,6), and (2,5,4).

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Answers are displayed within the problem

Q9

1/1 point (graded)
[Q9] Suppose relation R(A,B,C) has the following tuples:

A	B	C
1	2	3
4	2	3
4	5	6
2	5	3
1	2	6

and relation S(A,B,C) has the following tuples:

A	B	C
2	5	3
2	5	4
4	5	6

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1	2	3

Compute the intersection of the relations R and S. Which of the following tuples is in the result?

- (2,5,4)
- (2,5,3)
- (4,2,3)
- (2,2,6)

✔

Problem Explanation
Tuples are in the intersection of R and S if and only if they are in both R and S. These tuples are (1,2,3), (2,5,3), and (4,5,6).

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Answers are displayed within the problem

Q10

1/1 point (graded)
[Q10] Suppose relation R(A,B,C) has the following tuples:

A	B	C
1	2	3
4	2	3
4	5	6
2	5	3
1	2	6

and relation S(A,B,C) has the following tuples:

A	B	C
2	5	3
2	5	4
4	5	6
1	2	3

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