Gradiance Online Accelerated Learning

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1. The latest scores from the Japanese Baseball League are in the table with schema

Scores(Team, Opponent, RunsFor, RunsAgainst)

The data in this table is as follows:

Team	Opponent	RunsFor	RunsAgainst
Dragons	Tigers	5	3
Carp	Swallows	4	6
Bay Stars	Giants	2	1
Marines	Hawks	5	3
Ham Fighters	Buffaloes	1	6
Lions	Golden Eagles	8	12
Tigers	Dragons	3	5
Swallows	Carp	6	4
Giants	Bay Stars	1	2
Hawks	Marines	3	5
Buffaloes	Ham Fighters	6	1
Golden Eagles	Lions	12	8

What is the result of executing on this data the query:

```
SELECT Team
FROM Scores
WHERE RunsFor > RunsAgainst AND
    RunsFor <= RunsAgainst + 2
```

Identify in the list below, the team that appears in the output.

a) Giants
b) Marines
c) Tigers
d) Hawks

Answer submitted: **b)**

You have answered the question correctly.

Question Explanation:

The query asks for the teams that won their game (RunsFor > RunsAgaint), but not by more than two runs (RunsFor <= RunsAgainst + 2). These teams are the Dragons, Bay Stars, Marines, and Swallows.

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2. The table

Scores(Team, Day, Opponent, Runs)

Contains the following 12 rows:

Team	Day	Opponent	Runs
Dragons	Sunday	Swallows	4
Tigers	Sunday	Bay Stars	9
Carp	Sunday	NULL	NULL
Swallows	Sunday	Dragons	7
Bay Stars	Sunday	Tigers	2
Giants	Sunday	NULL	NULL
Dragons	Monday	Carp	NULL
Tigers	Monday	NULL	NULL
Carp	Monday	Dragons	NULL
Swallows	Monday	Giants	0
Bay Stars	Monday	NULL	NULL
Giants	Monday	Swallows	5

What is the result of the following query?

```
SELECT *
FROM Scores
ORDER BY Runs DESC, Team ASC
```

Identify in the list below a tuple and the correct order in which it appears.

a) | Tigers | Sunday | Bay Stars | 9 |
must appear last.

b) | Giants | Sunday | NULL | NULL |
must appear fifth.

c) | Carp | Monday | Dragons | NULL |
could appear fourth or fifth.

d) | Giants | Sunday | NULL | NULL |
must appear eleventh.

Answer submitted: **d)**

You have answered the question correctly.

Question Explanation:

We begin by sorting by Runs, highest first. That determines the position of the first six rows in the list below, since no rows have the same, non-NULL numbers of runs. However, the six rows with NULL for Runs go at the end, since NULL is treated as the lowest value.

We then try to break ties among the last six rows by sorting them ascending, in alphabetical order of the Team name. That orders these rows uniquely, except that the two rows for the "Carp" can be ordered in either order.

Team	Day	Opponent	Runs
Tigers	Sunday	Bay Stars	9
Swallows	Sunday	Dragons	7
Giants	Monday	Swallows	5
Dragons	Sunday	Swallows	4
Bay Stars	Sunday	Tigers	2
Swallows	Monday	Giants	0
Bay Stars	Monday	NULL	NULL
Carp	Sunday	NULL	NULL
Carp	Monday	Dragons	NULL
Dragons	Monday	Carp	NULL
Giants	Sunday	NULL	NULL
Tigers	Monday	NULL	NULL

---

3. Suppose we are to design a registrar's database to store information about students, courses, the courses students have taken, and the grades students have gotten in these courses. Courses have a number, a department, and a title, for example, "CS101: Introduction to computing" has department = CS, number = 101, and title = "Introduction to Computing." Numbers are assigned by departments, and different departments may use the same number. Students are represented by their (unique) student ID and their name. "Enrollments" each consist of a course, a student who took that course, and the grade the student got in the course. If we created a relational schema for this database, which of the following would LEAST likely be an attribute of some relation?

a) enrollment

b) number

c) name

d) title

Answer submitted: **a)**

You have answered the question correctly.

Question Explanation:

A likely schema for this situation is:

```
Courses(number, department, title)
Students(studentID, name)
Enrollments(studentID, number, department, grade)
```

The attributes of the several relations are: number, department, title, studentID, name, and grade.

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4. The latest scores from the Japanese Baseball League are in the table with schema

Scores(Team, Opponent, RunsFor, RunsAgainst)

The data in this table is as follows:

Team	Opponent	RunsFor	RunsAgainst
Dragons	Tigers	5	3
Carp	Swallows	4	6
Bay Stars	Giants	2	1
Marines	Hawks	5	3
Ham Fighters	Buffaloes	1	6
Lions	Golden Eagles	8	12
Tigers	Dragons	3	5
Swallows	Carp	6	4
Giants	Bay Stars	1	2
Hawks	Marines	3	5
Buffaloes	Ham Fighters	6	1
Golden Eagles	Lions	12	8

What is the result of executing on this data the query:

```
SELECT Team AS Winner, RunsFor + RunsAgainst AS Runs
FROM Scores
WHERE RunsFor > RunsAgainst
```

Identify in the list below, a value and the name of a column in which it appears.

a) 5 appears in column RunsFor.

b) "Swallows" appears in column Team.

c) "Hawks" appears in column Winner.

d) 10 appears in column Runs.

Answer submitted: **d)**

You have answered the question correctly.

Question Explanation:

The query selects only the rows where Team won their game, and renames the Team column to be Winner. The Opponent column is dropped, and the last two columns are summed and renamed Runs.

Winner	Runs
Dragons	8
Swallows	10
Bay Stars	3
Marines	8
Buffaloes	7
Golden Eagles	20

---

5. The table

Scores(Team, Day, Opponent, Runs)

Contains the following 12 rows:

Team	Day	Opponent	Runs
Dragons	Sunday	Swallows	4
Tigers	Sunday	Bay Stars	9
Carp	Sunday	NULL	NULL
Swallows	Sunday	Dragons	7
Bay Stars	Sunday	Tigers	2
Giants	Sunday	NULL	NULL
Dragons	Monday	Carp	NULL
Tigers	Monday	NULL	NULL
Carp	Monday	Dragons	NULL
Swallows	Monday	Giants	0
Bay Stars	Monday	NULL	NULL
Giants	Monday	Swallows	5

What is the result of the following query?

```
SELECT S1.Team, S2.Team
FROM Scores S1, Scores S2
WHERE S1.Opponent = S2.Opponent
    AND S1.Team <> S2.Team
```

Identify in the list below a tuple of the result.

a)

Swallows	Swallows

b)

Swallows	Carp

c)

Dragons	Dragons

d)

Giants	Giants

Answer submitted: **b)**

You have answered the question correctly.

Question Explanation:

The query asks for different teams that played the same opponent. Remember that when either S1.Opponent or S2.Opponent, or both, are NULL, the truth value of the WHERE condition is UNKNOWN. That is not sufficient for the pairing of rows to be passed to the SELECT clause. Thus, for example, the row (Carp, Giants) is **not** a tuple of the result, even though both teams had NULL as an "opponent." However, the Dragons and Giants both played the Swallows, so (Giants, Dragons) and (Dragons, Giants) each appear in the result. The complete output is:

S1.Team	S2.Team
Dragons	Giants
Giants	Dragons
Swallows	Carp
Carp	Swallows

---

6. The latest scores from the Japanese Baseball League are in the table with schema

Scores(Team, Opponent, RunsFor, RunsAgainst)

The data in this table is as follows:

Team	Opponent	RunsFor	RunsAgainst
Dragons	Tigers	5	3
Carp	Swallows	4	6
Bay Stars	Giants	2	1
Marines	Hawks	5	3
Ham Fighters	Buffaloes	1	6
Lions	Golden Eagles	8	12
Tigers	Dragons	3	5
Swallows	Carp	6	4
Giants	Bay Stars	1	2
Hawks	Marines	3	5
Buffaloes	Ham Fighters	6	1
Golden Eagles	Lions	12	8

What is the result of executing on this data the query:

```
SELECT Team, Opponent
FROM Scores
WHERE Team LIKE '% %' OR
    Opponent LIKE '_i%'
```

Identify, in the list below, a row of the result.

a)

Marines	Hawks

b)

Carp	Swallows

c)

Hawks	Marines

d)

Dragons	Tigers

Answer submitted: **d)**

You have answered the question correctly.

Question Explanation:

The query asks for the first two columns of a row, whenever one or both of the following two conditions are met:

1. The Team in that row has a blank in its name (i.e., the Bay Stars, Ham Fighters, and Golden Eagles are the only teams with a blank in their name). This condition selects rows 3, 5, and 12.
2. The second letter in the Opponent name is "i" (i.e., the Giants, Lions, and Tigers). This condition selects rows 1, 3, and 12. The union of these rows is 1, 3, 5, and 12.

The resulting output is:

Team	Opponent
Dragons	Tigers
Bay Stars	Giants
Ham Fighters	Buffaloes

Golden Eagles	Lions

---

7. The latest scores from the Japanese Baseball League are in the table with schema

Scores(Team1, Team2, Score1, Score2)

The data in this table is as follows:

Team1	Team2	Score1	Score2
Dragons	Tigers	5	3
Carp	Swallows	4	6
Bay Stars	Giants	2	1
Marines	Hawks	5	3
Ham Fighters	Buffaloes	1	6
Lions	Golden Eagles	8	12

What is the result of executing on this data the query:

```
SELECT Score1, Score2
FROM Scores
```

Identify in the list below one of the rows in your answer.

a)

4	6

b)

6	1

c)

12	8

d)

1	2

Answer submitted: **a)**

You have answered the question correctly.

Question Explanation:

The answer is the last two columns of the relation:

Score1	Score2
5	3
4	6
2	1
5	3
1	6
8	12

---

8. Here is a table representing a relation named R:

A	B	C
0	1	2

3	4	5
6	7	8

Identify:

1. The attributes of R.
2. The schema of R.
3. The tuples of R.
4. The components of the tuples for each attribute of R.

Which of the following is NOT a true statement about relation R?

a) 0 is the value of the A-component of one of the tuples of R.

b) R has four tuples.

c) The schema of R is R(A,B,C).

d) R has three tuples.

Answer submitted: **b)**

You have answered the question correctly.

Question Explanation:

The schema of R is R(A,B,C). The three column headers, A, B, and C, are the attributes of R. Each of the rows except the top (column headers) is a tuple; that is, the tuples are (0,1,2), (3,4,5), and (6,7,8). Each of the integers 0 through 8 is the value of some component of some tuple --- a component for the attribute heading its column. Thus, for instance, 0 is an A-component and 4 is a B-component.

---

9. Here are two relations, R(A,B) and S(C,D). Their current values are:

R =

A	B
1	2
3	4
5	6
7	8

S =

C	D
2	10
4	12
6	14
8	16

Compute the result of the query:

```
SELECT A, D
FROM R, S
WHERE B+C = 10
```

Identify, in the list below, the row that appears in the result.

a) (3,16)

b) (5,16)

c) (7,16)

d) (3,14)

Answer submitted: **d)**

You have answered the question correctly.

Question Explanation:

We must pair each row of R with each row of S, a total of 16 pairs. The WHERE condition asks for pairs where B+C = 10. Thus, for example, the first row of R, with B=2, pairs with the last row of S, with C=8. Similarly, the second row of R pairs successfully with the third row of S; the third row of R pairs with the second row of S, and the fourth row of R pairs with the first row of S. From these four successful pairings, the (A,D) tuples formed are (1,16), (3,14), (5,12), and (7,10). That is, the result table is:

A	D
1	16
3	14
5	12
7	10

---

10. The table

Scores(Team, Day, Opponent, Runs)

Gives the scores in the Japanese Baseball League for two consecutive days. The Opponent is NULL if the Team did not play on that day. The number of Runs is given as NULL if either the team did not play, or will play on that day but the game is not yet concluded. The data in this table is as follows:

Team	Day	Opponent	Runs
Dragons	Sunday	Swallows	4
Tigers	Sunday	Bay Stars	9
Carp	Sunday	NULL	NULL
Swallows	Sunday	Dragons	7
Bay Stars	Sunday	Tigers	2
Giants	Sunday	NULL	NULL
Dragons	Monday	Carp	NULL
Tigers	Monday	NULL	NULL
Carp	Monday	Dragons	NULL
Swallows	Monday	Giants	0
Bay Stars	Monday	NULL	NULL
Giants	Monday	Swallows	5

What is the result of executing on this data the query:

```
SELECT Team, Day
FROM Scores
WHERE Opponent IS NULL OR
    NOT (Runs >= 0)
```

Identify, in the list below, a row of the result.

a)

Carp	Sunday

b)

Dragons	Sunday

c)

Carp	Monday

d)

Swallows	Monday

Answer submitted: **a)**

You have answered the question correctly.

Question Explanation:

The first condition in the WHERE clause asks for all rows where the Opponent column is NULL (rows 3, 6, 8, and 11) or the Runs column is at least 0. Even though we know that it is impossible to score a negative number of runs, the truth value of "Runs>=NULL" is "unknown". Thus, the truth value of "NOT Runs>=NULL" is also "unknown", and the second condition of the WHERE clause is not "true" for any of the rows. Thus, only the four rows with NULL in the Opponent column meet the condition. The resulting output is:

Team	Day
Carp	Sunday
Giants	Sunday
Tigers	Monday
Bay Stars	Monday

---

11. Relation R has schema R(a,b,c). In the result of the query

```
SELECT a, b, c
FROM R
ORDER BY c DESC, b ASC;
```

What condition must a tuple *t* satisfy so that *t* **necessarily precedes** the tuple (5,5,5)? Identify one such tuple from the list below.

a) (0,9,5)

b) (7,5,5)

c) (8,6,5)

d) (8,0,5)

Answer submitted: **d)**

You have answered the question correctly.

Question Explanation:

Since the first term in the ORDER-BY clause is c DESC, any tuple whose third component is strictly greater than 5 will precede (5,5,5). If the third component is strictly less than 5, it cannot precede (5,5,5). What if the third component is exactly 5? Then we go by the second term of the ORDER-BY, which is b ASC. Thus, (x,y,5) precedes (5,5,5) whenever y < 5, and it cannot precede (5,5,5) if y > 5. What if y = 5? We don't know whether the tuple precedes (5,5,5), because the ORDER-BY doesn't specify what happens. Thus, we can only be sure that (x,y,z) precedes (5,5,5) if either z > 5 or (z = 5 and y < 5).

---

12. Here are three relations, R(a,b), S(a,b), and T(a,b). Their current values are:

R

a	b
0	0
0	1
1	0

S

a	b
0	0
0	1
1	0

T

a	b
0	0
0	1
1	0

Compute the result of the query:

```
SELECT R.a, R.b, S.b, T.b
FROM R, S, T
WHERE R.b = S.a AND S.b <> T.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.

a) (0,0,1,0) appears once.

b) (0,0,0,0) appears once.

c) (1,0,0,0) does not appear.

d) (1,0,0,1) appears once.

Answer submitted: **c)**

You have answered the question correctly.

Question Explanation:

The product of R, S, and T contains 64 tuples --- all sequences of six 0's and 1's. The WHERE condition R.b = S.a forces the second and third components to be the same, thus eliminating half the tuples and leaving 32. The condition S.b <> T.b eliminates half the remaining --- those that do not differ in the 4th and 6th components. The result is the 16 tuples of the form (w,x,x,y,z,y'), where *y*' is the complement of *y*, i.e., one is 0 and the other is 1.

The SELECT clause produces from each of these 16 tuples a row of the result: (w,x,y,y'). Since *z* can be either 0 or 1, each of these eight tuples is produced twice.

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13. The latest scores from the Japanese Baseball League are in the table with schema

Scores(Team, Opponent, RunsFor, RunsAgainst)

The data in this table is as follows:

Team	Opponent	RunsFor	RunsAgainst
Dragons	Tigers	5	3
Carp	Swallows	4	6
Bay Stars	Giants	2	1
Marines	Hawks	5	3
Ham Fighters	Buffaloes	1	6
Lions	Golden Eagles	8	12
Tigers	Dragons	3	5
Swallows	Carp	6	4
Giants	Bay Stars	1	2
Hawks	Marines	3	5
Buffaloes	Ham Fighters	6	1
Golden Eagles	Lions	12	8

What is the result of executing on this data the query:

```
SELECT S1.Team, S2.Team
FROM Scores S1, Scores S2
```

```
WHERE S1.Team < S2.Team AND
    (S1.RunsFor = S2.RunsFor
     OR S1.RunsAgainst = S2.RunsAgainst)
```

Remember that when strings are compared, "<" means "precedes in alphabetical order.

Identify, in the list below, a row of the result.

a)	Buffaloes	Golden Eagles
b)	Giants	Hawks
c)	Golden Eagles	Swallows
d)	Dragons	Marines

Answer submitted: **d)**

You have answered the question correctly.

Question Explanation:

The query asks for pairs of teams that either scored the same number of runs or had the same number scored against them, or both. The output must list the teams with the first preceding the second alphabetically.

For example, the Dragons and Marines scored the same number of runs --- 5. They also had the same number scored against them, but that is not necessary in order for (Dragons, Marines) to be part of the output. Notice that we must list the Dragons first, because "D" precedes "M" alphabetically. The entire output is shown below. Notice that the first two rows are pairs of teams with the same number of runs both for and against. The next two rows are teams that scored the same number of runs but had different numbers scored against them, and the last two rows are teams that scored different numbers of runs, but had the same number scored against them.

S1.Team	S2.team
Dragons	Marines
Hawks	Tigers
Giants	Ham Fighters
Buffaloes	Swallows
Carp	Ham Fighters
Bay Stars	Buffaloes

---

14. Suppose relations R(A,B) and S(B,C,D) have the tuples shown below:

R =

A	B
1	2
3	4
5	6

S =

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

Compute the result of the join query:

```
SELECT A, R.B, C, D
FROM R, S
WHERE R.B = S.B
```

Then, identify which of the following tuples is in the result.

a) (1,4,6,8)

b) (1,2,4,6)

c) (5,6,4,6)

d) (3,4,2,6)

Answer submitted: **b)**

You have answered the question correctly.

Question Explanation:

This query is a standard join, in which the columns from R and S that have the same name (B) are equated. 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 S(A,B) matches both (4,6,8) and (4,7,9) from R(B,C,D), and yields tuples (3,4,6,8) and (3,4,7,9) for the result. Tuple (5,6) from R(A,B) matches nothing from S(B,C,D), so there are no more tuples in the result.
