Case Study 2

Course(s): Databases
Day: 6

Problem Statement-

Description of the Tennis Club

The tennis club was founded in 1970. From the beginning, some administrative data was stored in a database. This database consists of the following tables:

- PLAYERS
- TEAMS
- MATCHES
- PENALTIES
- COMMITTEE_MEMBERS

The PLAYERS table contains data about players who are members of the club, such as names, addresses, and dates of birth. Players can join the club only at the first of January of a year. Players cannot join the club in the middle of the year.

The PLAYERS table contains no historical data. Any player giving up membership disappears from the table. If a player moves, the old address is overwritten with the new address. In other words, the old address is not retained anywhere.

The tennis club has two types of members: recreational players and competition players. The first group plays matches only among themselves (that is, no matches against players from other clubs). The results of these friendly matches are not recorded. Competition players play in teams against other clubs, and the results of these matches are recorded. Each player, regardless of whether he or she plays competitively, has a unique number assigned by the club. Each competition player must also be registered with the tennis league, and this national organization gives each player a unique league number. If a competition player stops playing in the competition and becomes a recreational player, his or her league number correspondingly disappears. Therefore, recreational players have no league number, but they do have a player number.

The club has a number of teams taking part in competitions. The captain of each team and the division in which it is currently competing is recorded. It is not necessary for the captain to have played a match for the team. It is possible for a certain player to be captain of two or more teams at a certain time. Again, no historical data is kept in this table. If a team is promoted or relegated to another division, the record is simply overwritten with the new information. The same goes for the captain of the team; when a new captain is appointed, the number of the former captain is overwritten.

A team consists of a number of players. When a team plays against a team from another tennis club, each player of that team plays against a player of the opposing team. (For the sake of simplicity, we assume that matches in which couples play against each other, the so-called doubles and mixes, do not occur.) The team in which the most players win their matches is the winner.

A team does not always consist of the same people, and reserves are sometimes needed when the regular players are sick or on vacation. A player can play matches for several teams. So, when we say "the players of a team," we mean the players who have played at least one match in that team. Again, only players with league numbers are allowed to play official matches.

Each match consists of a number of sets. The player who wins the most sets is the winner. Before the match begins, it is agreed how many sets need to be won to win the match. Generally, the match stops after one of the two players has won two or three sets. Possible end results of a tennis match are 21 or 20 if play continues until one player wins two sets (best of three), or 32, 31, or 30 if three sets need to be won (best of five). A player either wins or loses a match; a draw is not possible. In the MATCHES table, we record for each match separately which player was in the match and for which team he played. In addition, we record how many sets the player won and lost. From this, we can conclude whether the player won the match.

Note that the MATCHES table in this book is different in structure, layout, and contents from the MATCHES table in former editions of Introduction to SQL.

If a player behaves badly (arrives late, behaves aggressively, or does not show up at all), the league imposes a penalty in the form of a fine. The club pays these fines and records them in a PENALTIES table. If the player continues to play competitively, the record of all his or her penalties remains in this table.

If a player leaves the club, all his or her data in the five tables is destroyed. If the club withdraws a team, all data for that team is removed from the TEAMS and MATCHES tables. If a competition player stops playing matches and becomes a recreational player again, all matches and penalty data is deleted from the relevant tables.

Since January 1, 1990, a COMMITTEE_MEMBERS table has kept information about who is on the committee. There are four positions: chairman, treasurer, secretary, and a general member. On January 1 of each year, a new committee is elected. If a player is on the committee, the beginning and ending dates of his or her committee are recorded. If someone is still active, the end date remains op

The following is a description of the columns in each of the tables.

PLAYERS	
PLAYERNO	Unique player number assigned by the club.
NAME	Surname of the player, without initials.
INITIALS	Initials of the player. No full stops or spaces are used.
BIRTH_DATE	Date on which the player was born.
SEX	Sex of the player: M(ale) or F(emale).
JOINED	Year in which the player joined the club. This value cannot be smaller than 1970, the year in which the club was founded.
STREET	Name of the street on which the player lives.
HOUSENO	Number of the house.
POSTCODE	Post code.
TOWN	Town or city in which the player lives. We assume in this example that place names are unique for town or citiesor, in other words, there can never be two towns with the same name.
PHONENO	Area code followed by a hyphen and then the subscriber's number.
LEAGUENO	League number assigned by the league; a league number is unique.
TEAMS	
TEAMNO	Unique team number assigned by the club.
PLAYERNO	Player number of the player who captains the team. In principle, a player may captain several teams.
DIVISION	Division in which the league has placed the team.
MATCHES	
MATCHNO	Unique match number assigned by the club
TEAMNO	Number of the team
PLAYERNO	Number of the player
WON	Number of sets that the player won in the match
LOST	Number of sets that the player lost in the match
PENALTIES	
PAYMENTNO	Unique number for each penalty the club has paid. This number is assigned by the club.
PLAYERNO	Number of the player who has incurred the penalty.
PAYMENT_DATE	Date on which the penalty was paid. The year of this date should not be earlier than 1970, the year in which the club was founded.
AMOUNT	Amount in dollars incurred for the penalty.
COMMITTEE_MEMBERS	
PLAYERNO	The number of the player.
BEGIN_DATE	Date on which the player became an active member of the committee. This date should not be earlier than January 1, 1990, because this is the date on which the club started to record this data.
END_DATE	Date on which the player resigned his position in the committee. This date should not be earlier than the BEGIN_DATE but can be absent.
POSITION	Name of the position.

The Contents of the Tables

The contents of the tables are shown here. These rows of data form the basis of most of the examples and exercises. Some of the column names in the PLAYERS table have been shortened because of space constraints.

The PLAYERS table:

PLAYERNO	NAME	INIT	BIRTH_DATE	SEX	JOINED	STREET	...
2	Everett	R	1948-09-01	M	1975	Stoney Road	...
6	Parmenter	R	1964-06-25	M	1977	Haseltine Lane	...
7	Wise	GWS	1963-05-11	M	1981	Edgecombe Way	...
8	Newcastle	B	1962-07-08	F	1980	Station Road	...
27	Collins	DD	1964-12-28	F	1983	Long Drive	...
28	Collins	C	1963-06-22	F	1983	Old Main Road	...
39	Bishop	D	1956-10-29	M	1980	Eaton Square	...
44	Baker	E	1963-01-09	M	1980	Lewis Street	...
57	Brown	M	1971-08-17	M	1985	Edgecombe Way	...
83	Hope	PK	1956-11-11	M	1982	Magdalene Road	...
95	Miller	P	1963-05-14	M	1972	High Street	...
100	Parmenter	P	1963-02-28	M	1979	Haseltine Lane	...
104	Moorman	D	1970-05-10	F	1984	Stout Street	...
112	Bailey	IP	1963-10-01	F	1984	Vixen Road	...

The PLAYERS table (continued):

PLAYERNO	...	HOUSENO	POSTCODE	TOWN	PHONENO	LEAGUENO
2	...	43	3575NH	Stratford	070-237893	2411
6	...	80	1234KK	Stratford	070-476537	8467
7	...	39	9758VB	Stratford	070-347689	?
8	...	4	6584RO	Inglewood	070-458458	2983
27	...	804	8457DK	Eltham	079-234857	2513
28	...	10	1294QK	Midhurst	071-659599	?
39	...	78	9629CD	Stratford	070-393435	?
44	...	23	4444LJ	Inglewood	070-368753	1124
57	...	16	4377CB	Stratford	070-473458	6409
83	...	16A	1812UP	Stratford	070-353548	1608
95	...	33A	5746OP	Douglas	070-867564	?
100	...	80	1234KK	Stratford	070-494593	6524
104	...	65	9437AO	Eltham	079-987571	7060
112	...	8	6392LK	Plymouth	010-548745	1319

The TEAMS table:

TEAMNO	PLAYERNO	DIVISION
1	6	first
2	27	second

The MATCHES table:

MATCHNO	TEAMNO	PLAYERNO	WON	LOST
1	1	6	3	1

2	1	6	2	3
3	1	6	3	0
4	1	44	3	2
5	1	83	0	3
6	1	2	1	3
7	1	57	3	0
8	1	8	0	3
9	2	27	3	2
10	2	104	3	2
11	2	112	2	3
12	2	112	1	3
13	2	8	0	3

The `PENALTIES` table:

PAYMENTNO	PLAYERNO	PAYMENT_DATE	AMOUNT
1	6	1980-12-08	100.00
2	44	1981-05-05	75.00
3	27	1983-09-10	100.00
4	104	1984-12-08	50.00
5	44	1980-12-08	25.00
6	8	1980-12-08	25.00
7	44	1982-12-30	30.00
8	27	1984-11-12	75.00

The `COMMITTEE_MEMBERS` table:

PLAYERNO	BEGIN_DATE	END_DATE	POSITION
2	1990-01-01	1992-12-31	Chairman
2	1994-01-01	?	Member
6	1990-01-01	1990-12-31	Secretary
6	1991-01-01	1992-12-31	Member
6	1992-01-01	1993-12-31	Treasurer
6	1993-01-01	?	Chairman
8	1990-01-01	1990-12-31	Treasurer
8	1991-01-01	1991-12-31	Secretary
8	1993-01-01	1993-12-31	Member
8	1994-01-01	?	Member
27	1990-01-01	1990-12-31	Member
27	1991-01-01	1991-12-31	Treasurer
27	1993-01-01	1993-12-31	Treasurer
57	1992-01-01	1992-12-31	Secretary
95	1994-01-01	?	Treasurer
112	1992-01-01	1992-12-31	Member
112	1994-01-01	?	Secretary

Creating Tables

1. Create the five tables, with constraints, that form the Tennis club database.

Populating Tables with Data

2. The tables have been created and can now be filled with data. For this, we use `INSERT` statements.

Querying Tables

3. Get the number, the name, and the date of birth of each player resident in Stratford; sort the result in alphabetical order of name. (Note that Stratford starts with an uppercase letter.)
4. Get the number of each player who joined the club after 1980 and is resident in Stratford; order the result by player number
5. Get all the information about each penalty.

Updating and Deleting Rows

1. Change the amount of each penalty incurred by player 44 to $200.
2. Remove each penalty for which the amount is greater than $100. (We assume the changed contents of the PENALTIES table.)

Optimizing Query Processing with Indexes

1. Create an index on the AMOUNT column of the PENALTIES table.

Views

2. Create a view in which the difference between the number of sets won and the number of sets lost are recorded for each match.

Users and Data Security

3. Imagine that the two SQL users DIANE and PAUL have been created. SQL will reject most of their SQL statements as long as they have not been granted privileges. The following three statements give them the required privileges. We assume that a third SQL user (for example, BOOKSQL) grants these privileges.

Deleting Database Objects

1. Delete the MATCHES table.
2. Delete the view NUMBER_SETS.
3. Delete the PENALTIES_AMOUNT index.
4. Delete the TENNIS database.

Querying and Updating Data

1. Get the match number and the difference between sets won and sets lost for each match of which the numbers of sets won equals the number of sets lost plus 2.
2. Get the number and the division for each team.
3. Get for each team the number and the division, and use the full names.
4. For each penalty, get the payment number and the penalty amount in cents.
5. Change the league number of the player with number 2 to the NULL value.
6. For each team, get the number followed by the NULL value.

The Aggregation Function and the Scalar Subquery

1. Find the number of each team. Here are three possible solutions; we assume that the TEAMS table is stored in the TENNIS database and that we use MySQL.
2. Get the team number and the name of the captain of each team.

3. For each penalty, get the payment number, the amount of the penalty, the player number, and the name and initials of the player who incurred the penalty. Make use of pseudonyms.

Joins

1. Get the numbers of the captains who have incurred at least one penalty.
2. Get the numbers of the captains who have incurred at least one penalty. Remove the duplicate numbers.
3. Get the numbers of the players who are older than R. Parmenter; in this example, we assume that the combination of name and initials is unique.
4. For all the players, find the player number, the name, and the penalties incurred by him or her; order the result by player number.
5. For each penalty, get the payment number and the name of the player

Comparison Operators with Subqueries

1. Get the number and name of the player who captains team 1.

Aggregation Functions

1. How many league numbers are there?
2. What is the highest penalty?
3. What is the total amount of penalties incurred by players from Inglewood?
4. Get the variance of all penalties incurred by player 44.

Group by clause

1. For each year present in the PENALTIES table, get the number of penalties paid.
2. Get the list with the different penalty amounts in cents.
3. What is the average total amount of penalties for players who live in Stratford and Inglewood?
4. For each player, find the sum of all his or her penalties, plus the sum of all penalties.
5. Get the number of each player who has incurred more than one penalty.

Set operators

1. Get the player number and the town of each player from Inglewood and Plymouth.
2. Get the player number and the date of birth of each player who is living in Stratford and who was born after 1960.

Index

1. Get all information about player 44. (We assume that there is an index defined on the PLAYERNO column.)
2. Create an index on the POSTCODE column of the PLAYERS table.
3. Remove the three indexes that have been defined in the previous examples.
4. Create a multitable index on the PLAYERNO columns of the PLAYERS and MATCHES table.

View

1. Create a view that holds all town names from the PLAYERS table, and show the virtual contents of this new view.

2. Create a view that holds the player number, name, initials, and date of birth of each player who lives in Stratford.
3. Create a view that holds all players born before 1960.

Stored Procedures

1. Create a stored procedure that removes all matches played by a specific player.
2. Create a stored procedure that calculates the total of the penalties of a certain player. After that, call the procedure for player 27.
3. Create a stored procedure with which an existing team number is entered.
4. Create a stored procedure that counts the number of rows in the PLAYERS table.
5. Develop a stored procedure that adds a new team.
6. Remove the DELETE_PLAYER procedure.

Stored Functions

1. Create a stored function that returns the American dollar value of the penalty amounts. After that, get for each penalty the payment number and the euro and dollar value of each penalty amount.
2. Create two stored functions that determine, respectively, the number of penalties and the number of matches of a certain player. After that, get the numbers, names, and initials of those players whose number of penalties is greater than the number of matches.

Triggers

1. Create the trigger that updates the CHANGES table automatically when rows from the PLAYERS table are removed.
2. Create the UPDATE_PLAYER2 trigger that updates the CHANGES table automatically if the LEAGUENO column is changed.
3. Create a trigger on the PLAYERS table that makes sure that if a new player is added, he or she is also added to the PLAYERS_MAT table.