

The Tennis Club Sample Database

2.1 INTRODUCTION

This chapter describes a database that a tennis club could use to record its players' progress in a competition. Most of the examples and exercises in this book are based on this database, so you should study it carefully.

2.2 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 who gives up membership disappears from the table. If a player moves, the new address overwrites the old 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. Regardless of whether he or she plays competitively, each player 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*. This league number usually contains digits, but it can also consist of letters. 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 are 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 a captain of two or more teams at a certain time. Again, this table records no historical data. If a team is promoted or relegated to another division, the new information simply overwrites the record. 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, assume that matches in which couples play against each other, the so-called doubles and mixes, do not occur). The team for 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 must 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 2–1 or 2–0 if play continues until one player wins two sets (best of three), or 3–2, 3–1, or 3–0 if three sets need to be won (best of five). A player either wins or loses a match; a draw is not possible. The MATCHES table records for each match separately which player was in the match and for which team he played. In addition, it records how many *sets* the player won and lost. From this, we can conclude whether the player won the match.

If a player behaves badly (arrives late, behaves aggressively, or does not show up) the league imposes a penalty in the form of a fine. The club pays these fines and

records them in a PENALTIES table. As long as 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. Four positions exist: chairman, treasurer, secretary, and 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 open. Figure 2.1 shows which player was on the committee in which period.

PLAYER	1-1-1990	1-1-1991	1-1-1992	1-1-1993	1-1-1994 now
2	secretary	chairman	treasurer	chairman	member
6	treasurer	member	member	member	
8	member	secretary	member	treasurer	
27		treasurer			
57			secretary		
95					treasurer
112			member		secretary

FIGURE 2.1 Which player occupied which position on the committee in which period?

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).

continues

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	Postcode.
TOWN	Town or city in which the player lives. Assume in this example that place-names are unique for town or cities; 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. The club assigns this number.
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	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.

2.3 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

2.4 INTEGRITY CONSTRAINTS

Of course, the contents of the tables must satisfy a number of integrity constraints. For example, two players may not have the same player number, and every player number in the PENALTIES table must also appear in the MATCHES table. This section lists all the applicable integrity constraints.

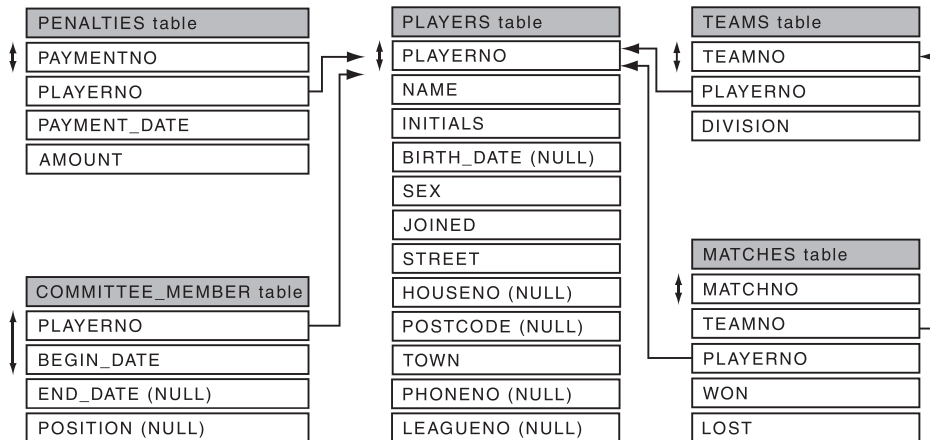


FIGURE 2.2 Diagram of the relationships between the tennis club database tables

A primary key has been defined for each table. The following columns are the primary keys for their respective tables. Figure 2.2 contains a diagram of the database. A double-headed arrow at the side of a column (or combination of columns) indicates the primary key of a table:

- PLAYERNO of PLAYERS
- TEAMNO of TEAMS
- MATCHNO of MATCHES
- PAYMENTNO of PENALTIES
- PLAYERNO plus BEGIN_DATE of COMMITTEE_MEMBERS

The example database has no alternate keys. The LEAGUENO column in the PLAYERS table looks like one but isn't. All the values are unique, but the column also allows null values and, therefore, can be no alternate key.

The database supports five foreign keys. In Figure 2.2, single-headed arrows show the foreign keys; these run from one table to another (this notation, in which the arrows point to the primary key, is used in [DATE95] and elsewhere). The foreign keys are as follows:

- **From TEAMS to PLAYERS**—Each captain of a team is also a player. The set of player numbers from the TEAMS table is a subset of the set of player numbers from the PLAYERS table.
- **From MATCHES to PLAYERS**—Each player who competes for a particular team must appear in the PLAYERS table. The set of player numbers from the MATCHES table is a subset of the set of player numbers from the PLAYERS table.
- **From MATCHES to TEAMS**—Each team that appears in the MATCHES table must also be present in the TEAMS table because a player can compete for only a registered team. The set of team numbers from the MATCHES table is a subset of the set of team numbers from the TEAMS table.
- **From PENALTIES to PLAYERS**—A penalty can be imposed on only players appearing in the PLAYERS table. The set of player numbers from the PENALTIES table is a subset of the set of player numbers from the PLAYERS table.
- **From COMMITTEE_MEMBERS to PLAYERS**—Each player who is or was a member of the committee must also be present in the PLAYERS table. The set of player numbers from the COMMITTEE_MEMBERS table is a subset of the set of player numbers from the PLAYERS table.

The following integrity constraints also hold:

- Two players cannot have identical league numbers.
- The year of birth of a player must be earlier than the year in which he or she joined the club.
- The sex of a player should always be M or F.
- The year in which the player joined the club should be greater than 1969 because the tennis club was founded in 1970.
- The postcode must always be a code of six characters.
- The division of a team can be nothing but first or second.
- Both the columns WON and LOST must have a value between 0 and 3.
- The payment date should be January 1, 1970, or later.
- Each penalty amount must always be greater than zero.
- The begin date in the COMMITTEE_MEMBERS table should always be later than or equal to January 1, 1990, because recording of this data was started on that day.
- The end date on which the player ended service as a committee member must always be later than the begin date.