University of British Columbia, Vancouver
Department of Computer Science

CPSC 304 Project Cover Page

Milestone #: ___2_____

Date: __October 20th, 2023___

Group Number: ___155___

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

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PROJECT DESCRIPTION

Our relational DBMS application keeps track of a basketball league with player information, team information, game information, sponsors, owners, game locations, etc.
The database can be used to search up records of certain games can be used to keep track of all the game's associated information.
The application will provide users with a range of functionalities and capabilities, allowing them to interact with and retrieve various types of information related to basketball teams, players, games, and more.

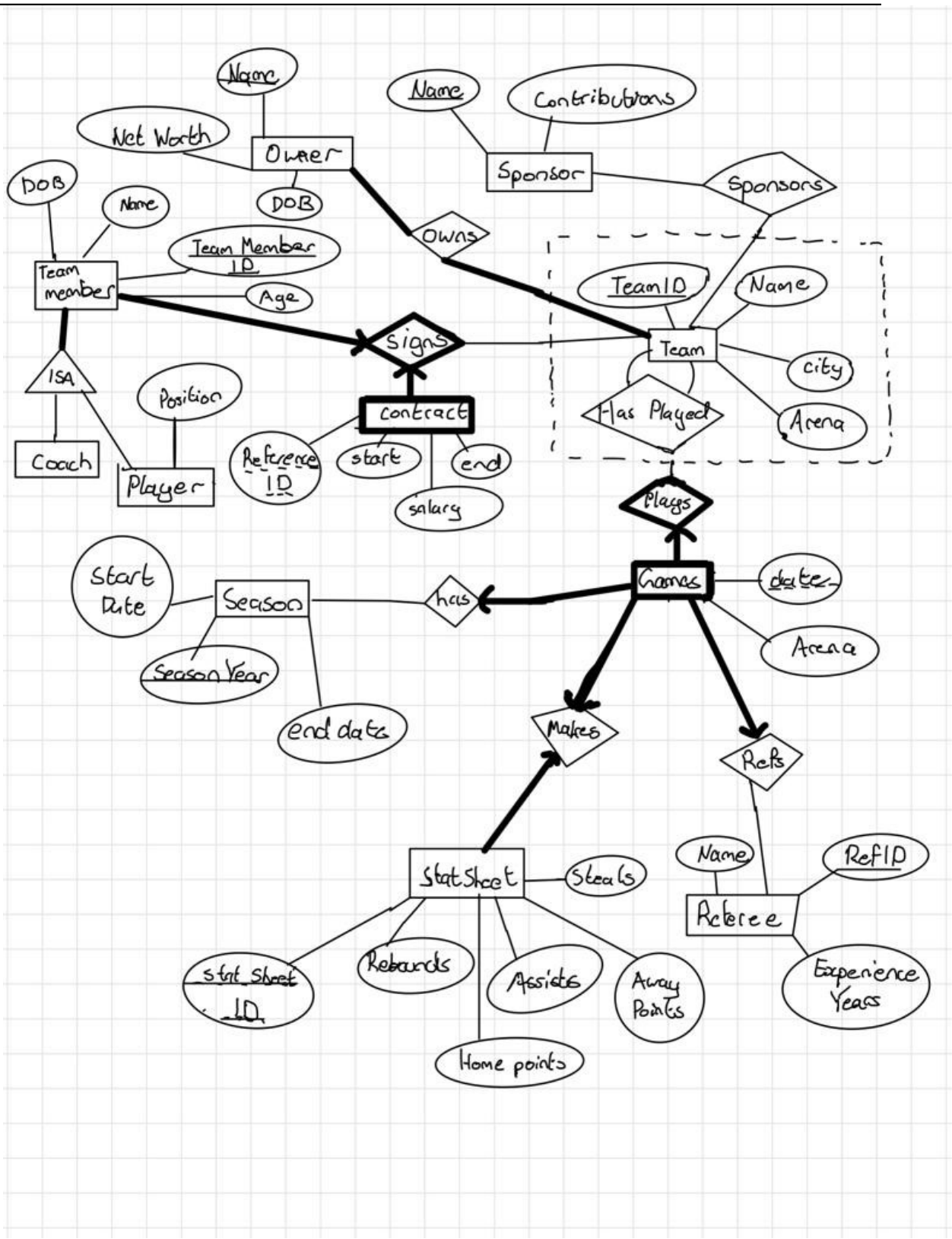
ER DIAGRAM CHANGES

Changes requested by the TA:

- The "owns" relationship is no longer bolded.
- Weak entity "contract" is no longer on the 'one' side of a one-to-many relationship.
- The ISA hierarchy now has two subclasses.
- The 'has' and 'refs' relationships are no longer bolded.
- StatSheet now has a key.

Other changes:

- Added the relationship 'HasPlayed'.
- 'Game' is now a weak entity that depends on the 'HasPlayed' aggregation. Its partial key is the date of the game. Our previous design allowed for any number of teams to participate in a game. With this change we restrict the number of teams in a game to exactly two.
- Removed the 'HomeTeam' and 'AwayTeam' attributes from 'Game'. They can be inferred from the owner of each 'Game' object.
- Removed score from game
- Removed points from Statsheets, and added home-points and away-points
- Added Arena to Game Table
- Added dob, age to TeamMember
- Renamed amount to salary
- Made Terms no longer a key of Contract


Name
Net Worth
Owner
DOB
Name
Contributions
Sponsor
Sponsors
DOB
Name
Team Member ID
Age
Owns
Team member
ISA
Coach
Player
Position
Signs
contract
Referee ID
start
end
salary
TeamID
Name
Team
city
Has Played
Arena
Plays
Games
dates
Arena
Start Date
Season
has
Season Year
end date
Makes
Refs
StatSheet
Steals
stat_sheet_ID
Rebounds
Assists
Away Points
Home points
Name
RefID
Referee
Experience Years

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RELATIONAL MODEL

TeamMember (tmid: int, name: char(20), cid: int, **tid**: int, start: date, end: date, salary: int, dob : date, age: int)
- tmid PRIMARY KEY
- cid CANDIDATE KEY NOT NULL
- name NOT NULL
- tid FOREIGN KEY REFERENCES Team (tid) ON DELETE CASCASE
- start, end and salary NOT NULL

Player (**tmid**: int, position: char(10))
- tmid PRIMARY KEY
- tmid FOREIGN KEY, references TeamMember(tmid)

Coach (**tmid**: int)
- tmid PRIMARY KEY
- tmid FOREIGN KEY, references TeamMember(tmid)

Season (year: int, start-date: date, end-date: date)
- year PRIMARY KEY
- start date, end date are CANDIDATE KEYS

Owner (name: char(20), dob: date, net-worth: int)
- name PRIMARY KEY
- dob NOT NULL
- DEFAULT net-worth is 0

Sponsor (name: char(20), contribution: int)
- name PRIMARY KEY
- DEFAULT contribution is 0

Team (tid: int, name: char(20), city: char(20) , arena: char(20))
- tid PRIMARY KEY
- name, city and arena NOT NULL

HasPlayed (**home-tid**: int, **away-tid**: int)
- (home-tid, away-tid) PRIMARY KEY
- home-tid FOREIGN KEY, references Team(tid)
- away-tid FOREIGN KEY, references Team(tid)

Referee (rid: int, name: char(20), experience-years: int)

- rid PRIMARY KEY
- name NOT NULL
- DEFAULT experience-years is 0

StatSheet (ssid: int, home-points: int, away-points: int, steals: int, assists: int, rebounds: int)
- ssid PRIMARY KEY
- home-points, away-points, steals, assists and rebounds DEFAULT to 0

Game (date: date**, home-tid**: int, **away-tid**: int, **ssid**: int, **year:** int, **rid**: int, arena: char(20))
- (date, home-tid, away-tid) PRIMARY KEY
- home-tid FOREIGN KEY, references HasPlayed(home-tid)
- away-tid FOREIGN KEY, references HasPlayed(away-tid)
- ssid FOREIGN KEY, UNIQUE, references StatSheet(ssid), NOT NULL
- year FOREIGN KEY, UNIQUE, references Season(year), NOT NULL
- rid FOREIGN KEY, UNIQUE, references Referee(rid), NOT NULL
- arena NOT NULL

Owns (**oname**: char(20), **tid**: int)
- (oname, tid) PRIMARY KEY
- oname FOREIGN KEY, references Owner(name)
- tid FOREIGN KEY, references Team(tid)

Sponsors (**sname**: char(20), **tid**: int)
- (sname, tid) PRIMARY KEY
- sname FOREIGN KEY, references Sponsor(name)
- tid FOREIGN KEY, references Team(tid)

FUNCTIONAL DEPENDANCIES (FDs)

TeamMember (tmid, name, cid, **tid**, start, end, salary, dob, age)
- PK: tmid
- FD: tmid → name, cid, tid, start, end, salary, dob, age
- FD: cid → tmid, name, cid, start, end, salary, dob, age
- FD: dob → age

Player (**tmid**, position):
- PK: tmid
- FD: tmid → position

Coach (**tmid**):
- PK: tmid

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Season (year, start-date, end-date):
- PK: year
- CK: (start-date, end-date)
- FD: year → start-date, end-date
- FD: start-date → year, end-date
- FD: end-date → year, start-date

Owner (name, dob, net-worth):
- PK: name
- FD: name → dob, net-worth

Sponsor (name, contribution):
- PK: name
- FD: name → contribution

Team (tid, name, city, arena):
- PK: tid
- FD: tid → name, city, arena
- FD: arena → city

HasPlayed (**home-tid**, **away-tid**):
- PK: (home-tid, away-tid)

Referee (rid, name, experience-years):
- PK: rid
- FD: rid → name, experience-years

StatSheet (ssid, home-points, away-points, steals, assists, rebounds):
- PK: ssid
- FD: ssid → home-points, away-points, steals, assists, rebounds

Game (date, **home-tid**, **away-tid**, score, **ssid, year, rid**, arena):
- PK: (date, home-tid, away-tid)
- FD: home-tid, away-tid, date → score, ssid, year, rid
- FD: ssid →date, home-tid, away-tid
- FD: home-tid → arena

Owns (oname, tid):
- PK: (oname, tid)

Sponsors (sname, tid):
- PK: (sname, tid)

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NORMALIZATION

All relations are in 3NF except for TeamMember, Team and Game because of the highlighted FDs.

- TeamMember is not in 3NF because of dob → age. We normalize this by adding a new relation Age (dob, age), where dob is the primary key. Age is in BCNF because it has only 2 attributes and TeamMember(tmid, name, cid, tid, start, end, salary, dob) is also BCNF because the two remaining FDs have a CK on the LHS.
- Game is not in 2NF because the arena depends on a proper subset of the PK. We can solve this by creating a new table Location (home-tid, arena), which we can then merge into the Team relation. Game(date, home-tid, away-tid, score, ssid, year, rid) is in BCNF because the remaining FDs have a CK on the LHS.
- Team is not in 3NF because of (arena → city). To solve this, we can split Team into two relations: Team(tid, name, arena) and Locations(arena, city). Both relations are now in BCNF.

The list of all relations is now:

TeamMember (tmid: int, name: char(20), cid: int, **tid**: int, start: date, end: date, salary: int, **dob**: date)

- tmid is PK
- cid is CK, not null
- name cannot be null
- tid is FK, not null, references Team(tid), on delete cascade
- all of start, end and salary are not null
- dob is FK, references Age(dob), on delete set null

Age (dob: date, age: int)

- dob is PK
- age is not null

Player (**tmid**: int, position: char(10))

- tmid is PK and FK, references TeamMember(tmid)

Coach (**tmid**: int)

- tmid is PK and FK, references TeamMember(tmid)

Season (year: int, start-date: date, end-date: date)

- year is PK
- both start date and end date are CK

Owner (name: char(20), dob: date, net-worth: int)

- name is PK

- dob can't be null
- default net-worth is 0

Sponsor (name: char(20), contribution: int)
- name is PK
- default contribution is 0

Team (tid: int, name: char(20), **arena**: char(20))
- tid is PK
- arena is FK, references Locations(arena), on delete set null
- name can't be null

Locations (arena: char(20), city: char(20))
- arena is PK
- city can't be null

HasPlayed (**home-tid**: int, **away-tid**: int)
- (home-tid, away-tid) is PK
- home-tid is FK, references Team(tid)
- away-tid is FK, references Team(tid)

Game (date: int, **home-tid**: int, **away-tid**: int, **ssid**: int, **year**: int, **rid**: int)
- (date, home-tid, away-tid) is PK
- home-tid is FK, references HasPlayed(home-tid)
- away-tid is FK, references HasPlayed(away-tid)
- ssid is CK, FK, unique, references StatSheet(ssid), not null
- year is FK, unique, references Season(year), not null
- rid is FK, unique, references Referee(rid), not null
- arena is not null

Referee (rid: int, name: char(20), experience-years: int)
- rid is PK
- name can't be null
- default experience-years is 0

StatSheet (ssid: int, home-points: int, away-points: int, steals: int, assists: int, rebounds: int)
- ssid is PK
- home-points, away-points, steals, assists and rebounds default to 0
-

Owns (**oname**: char(20), **tid**: int)
- (oname, tid) is PK
- oname is FK, references Owner(name)
- tid is FK, references Team(tid)

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Sponsors (**sname**: char(20), **tid**: int)

- (sname, tid) is PK
- sname is FK, references Sponsor(name)
- tid is FK, references Team(tid)

SQL DDL STATEMENTS

```
CREATE TABLE TeamMember (
   tmid          INT             PRIMARY KEY NOT NULL,
   name          CHAR(20)        NOT NULL,
   cid           INT,
   tid           INT,
   start         DATE            NOT NULL,
   end           DATE            NOT NULL,
   salary        INT             NOT NULL,
   dob           DATE            NOT NULL,
   age           INT,
   FOREIGN KEY (tid) REFERENCES Team(tid) ON DELETE CASCADE
);

CREATE TABLE Player (
   tmid          INT              PRIMARY KEY,
   position      CHAR(10),
   FOREIGN KEY (tmid) REFERENCES TeamMember(tmid)
);

CREATE TABLE Age(
   dob           DATE             PRIMARY KEY,
   age           INT              NOT NULL
);

CREATE TABLE Location (
   arena         CHAR(20)              PRIMARY KEY,
   city          CHAR(20)              NOT NULL
);


CREATE TABLE Coach (
   tmid          INT              PRIMARY KEY,
   FOREIGN KEY (tmid) REFERENCES TeamMember(tmid)
);
```

```
CREATE TABLE Season (
   year          INT             PRIMARY KEY,
   start_date    DATE            NOT NULL,
   end_date      DATE,
   CHECK (start_date <= end_date)
);

CREATE TABLE Owner (
   name          CHAR(20)        PRIMARY KEY,
   dob           DATE            NOT NULL,
   net_worth     INT             DEFAULT 0
);

CREATE TABLE Sponsor (
   name          CHAR(20)        PRIMARY KEY,
   contribution INT      DEFAULT 0
);

CREATE TABLE Team (
   tid           INT             PRIMARY KEY,
   name          CHAR(20)        NOT NULL,
   city          CHAR(20)        NOT NULL,
   arena         CHAR(20)        NOT NULL
);

CREATE TABLE HasPlayed (
   home_tid      INT,
   away_tid      INT,
   PRIMARY KEY (home_tid, away_tid),
   FOREIGN KEY (home_tid) REFERENCES Team(tid),
   FOREIGN KEY (away_tid) REFERENCES Team(tid)
);

CREATE TABLE Referee (
   rid           INT      PRIMARY KEY,
   name          CHAR(20) NOT NULL,
   experience_years INT DEFAULT 0
);

CREATE TABLE StatSheet (
   ssid          INT      PRIMARY KEY,
   home-points           INT      DEFAULT 0,
```

```
  away-points       INT     DEFAULT 0,
  steals        INT     DEFAULT 0,
  assists       INT     DEFAULT 0,
  rebounds      INT     DEFAULT 0
);

CREATE TABLE Game (
  date          date,
  home_tid      INT,
  away_tid      INT,
  score         CHAR(10),
  ssid          INT     NOT NULL,
  year          INT     NOT NULL,
  rid           INT     NOT NULL,
  arena         INT     NOT NULL,
  PRIMARY KEY (date, home_tid, away_tid),
  FOREIGN KEY (home_tid) REFERENCES HasPlayed(home_tid),
  FOREIGN KEY (away_tid) REFERENCES HasPlayed(away_tid),
  FOREIGN KEY (ssid) REFERENCES StatSheet(ssid),
  FOREIGN KEY (year) REFERENCES Season(year),
  FOREIGN KEY (rid) REFERENCES Referee(rid)
);

CREATE TABLE Owns (
  oname         CHAR(20),
  tid            INT,
  PRIMARY KEY (oname, tid),
  FOREIGN KEY (oname) REFERENCES Owner(name),
  FOREIGN KEY (tid) REFERENCES Team(tid)
);

CREATE TABLE Sponsors (
  sname         CHAR(20),
  tid           INT,
  PRIMARY KEY (sname, tid),
  FOREIGN KEY (sname) REFERENCES Sponsor(name),
  FOREIGN KEY (tid) REFERENCES Team(tid)
);
```

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INSERT STATEMENTS

TeamMember (tmid: int, name: char(20), cid: int, **tid**: int, start: date, end: date, salary: int, dob : date, age: int)

```
INSERT INTO TeamMember VALUES (1, 'John Doe', 101, 201, '2023-01-15', '2023-12-31', 60000, '1990-05-12', 33);
INSERT INTO TeamMember VALUES (2, 'Jane Smith', 102, 202, '2023-03-20', '2023-11-30', 55000, '1988-09-28', 35);
INSERT INTO TeamMember VALUES (3, 'Michael Johnson', 103, 203, '2023-02-10', '2023-10-15', 62000, '1995-04-05', 28);
INSERT INTO TeamMember VALUES (4, 'Sarah Williams', 104, 204, '2023-05-05', '2023-09-15', 58000, '1993-07-22', 30);
INSERT INTO TeamMember VALUES (5, 'David Brown', 105, 205, '2023-04-01', '2023-12-31', 64000, '1991-11-18', 31);
INSERT INTO TeamMember VALUES (6, 'Emily Davis', 101, 206, '2023-06-10', '2023-08-30', 57000, '1994-02-15', 29);
INSERT INTO TeamMember VALUES (7, 'Matthew Wilson', 102, 207, '2023-07-15', '2023-11-20', 60000, '1996-12-08', 26);
INSERT INTO TeamMember VALUES (8, 'Olivia White', 103, 208, '2023-02-25', '2023-10-10', 59000, '1992-03-30', 31);
INSERT INTO TeamMember VALUES (9, 'James Miller', 104, 209, '2023-04-15', '2023-09-05', 61000, '1989-08-06', 34);
INSERT INTO TeamMember VALUES (10, 'Sophia Wilson', 105, 210, '2023-01-30', '2023-12-31', 63000, '1997-06-14', 26);
INSERT INTO TeamMember VALUES (11, 'Liam Anderson', 101, 211, '2023-03-05', '2023-12-31', 59000, '1990-08-11', 33);
INSERT INTO TeamMember VALUES (12, 'Ava Moore', 102, 212, '2023-02-20', '2023-10-25', 61000, '1996-01-24', 27);
```

Player (**tmid**: int, position: char(10))

```
INSERT INTO Player VALUES (1, 'Point Guard');
INSERT INTO Player VALUES (2, 'Shooting Guard');
INSERT INTO Player VALUES (3, 'Power Forward');
INSERT INTO Player VALUES (4, 'Small Forward');
INSERT INTO Player VALUES (5, 'Center');
INSERT INTO Player VALUES (6, 'Shooting Guard');
INSERT INTO Player VALUES (7, 'Small Forward');
INSERT INTO Player VALUES (8, 'Point Guard');
INSERT INTO Player VALUES (9, 'Center');
INSERT INTO Player VALUES (10, 'Power Forward');
```

Coach (**tmid**: int)

```
INSERT INTO Coach VALUES (1);
INSERT INTO Coach VALUES (2);
INSERT INTO Coach VALUES (3);
INSERT INTO Coach VALUES (4);
INSERT INTO Coach VALUES (5);
```

Season (year: int, start-date: date, end-date: date)

```
INSERT INTO Season VALUES (2021, '2021-10-01', '2022-04-30');
INSERT INTO Season VALUES (2022, '2022-10-01', '2023-04-30');
INSERT INTO Season VALUES (2023, '2023-10-01', '2024-04-30');
INSERT INTO Season VALUES (2024, '2024-10-01', '2025-04-30');
INSERT INTO Season VALUES (2025, '2025-10-01', '2026-04-30');
```

Owner (name: char(20), dob: date, net-worth: int)

```
INSERT INTO Owner VALUES ('Alice Johnson', '1980-05-15', 1000000);
INSERT INTO Owner VALUES ('Bob Smith', '1975-08-20', 1500000);
INSERT INTO Owner VALUES ('Charlie Brown', '1990-02-10', 800000);
INSERT INTO Owner VALUES ('Donna Williams', '1985-11-05', 1200000);
INSERT INTO Owner VALUES ('Eva Davis', '1970-04-30', 2000000);
```

Sponsor (name: char(20), contribution: int)

```
INSERT INTO Sponsor VALUES ('AC Corporation', 5000);
INSERT INTO Sponsor VALUES ('X Corp', 7500);
INSERT INTO Sponsor VALUES ('SportsTech Inc', 10000);
INSERT INTO Sponsor VALUES ('City Bank', 3000);
INSERT INTO Sponsor VALUES ('Global Motors', 8000);
```

Team (tid: int, name: char(20), city: char(20) , arena: char(20))

```
INSERT INTO Team VALUES (1, 'Raptors', 'Toronto', 'Raptors Arena');
INSERT INTO Team VALUES (2, 'Lakers', 'Los Angeles', 'Staples Center');
INSERT INTO Team VALUES (3, 'Celtics', 'Boston', 'TD Garden');
INSERT INTO Team VALUES (4, 'Warriors', 'San Francisco', 'Chase Center');
INSERT INTO Team VALUES (5, 'Heat', 'Miami', 'American Airlines Arena');
```

HasPlayed (**home-tid**: int, **away-tid**: int)

```
INSERT INTO HasPlayed VALUES (1, 2);
```

INSERT INTO HasPlayed VALUES (3, 4);
INSERT INTO HasPlayed VALUES (2, 5);
INSERT INTO HasPlayed VALUES (4, 1);
INSERT INTO HasPlayed VALUES (5, 3);

Referee (rid: int, name: char(20), experience-years: int)

INSERT INTO Referee VALUES (101, 'John Smith', 10);
INSERT INTO Referee VALUES (102, 'Mary Johnson', 8);
INSERT INTO Referee VALUES (103, 'David Brown', 12);
INSERT INTO Referee VALUES (104, 'Sara White', 7);
INSERT INTO Referee VALUES (105, 'Michael Davis', 9);

StatSheet (ssid: int, home-points: int, away-points: int, steals: int, assists: int, rebounds: int)

INSERT INTO StatSheet VALUES (1, 2, 5, 5, 10, 7);
INSERT INTO StatSheet VALUES (2, 2, 0, 3, 8, 12);
INSERT INTO StatSheet VALUES (3, 2, 8, 4, 6, 9);
INSERT INTO StatSheet VALUES (4, 2, 2, 6, 9, 8);
INSERT INTO StatSheet VALUES (5, 1, 9, 2, 7, 10);

Game (date: date**, home-tid**: int, **away-tid**: int, score: char(10), **ssid**: int, **year:** int, **rid**: int)

INSERT INTO Game VALUES ('2023-10-01', 1, 2, '1-1', 1, 2023, 101),
INSERT INTO Game VALUES ('2023-10-02', 3, 4, '2-0', 2, 2023, 102);
INSERT INTO Game VALUES ('2023-10-03', 2, 5, '1-2', 3, 2023, 103);
INSERT INTO Game VALUES ('2023-10-04', 4, 1, '1-0', 4, 2023, 104);
INSERT INTO Game VALUES ('2023-10-05', 5, 3, '0-5', 5, 2023, 105);

Owns (**oname**: char(20), **tid**: int)

INSERT INTO Owns VALUES ('Alice Sports Group', 1);
INSERT INTO Owns VALUES ('Bob Holdings', 2);
INSERT INTO Owns VALUES ('Chris Investment', 3);
INSERT INTO Owns VALUES ('David Management', 4);
INSERT INTO Owns VALUES ('Eva Enterprises', 5);

Sponsors (**sname**: char(20), **tid**: int)

INSERT INTO Sponsors VALUES ('ABC Corporation', 1);
INSERT INTO Sponsors VALUES ('XYZ Corp', 2);
INSERT INTO Sponsors VALUES ('SportsTech Inc', 3);

INSERT INTO Sponsors VALUES ('City Bank', 4);
INSERT INTO Sponsors VALUES ('Global Motors', 5);

Age (dob: date, age: int)

INSERT INTO Age (dob, age) VALUES ('1990-05-12', 33);
INSERT INTO Age (dob, age) VALUES ('1988-09-28', 35);
INSERT INTO Age (dob, age) VALUES ('1995-04-05', 28);
INSERT INTO Age (dob, age) VALUES ('1993-07-22', 30);
INSERT INTO Age (dob, age) VALUES ('1991-11-18', 31);
INSERT INTO Age (dob, age) VALUES ('1994-02-15', 29);
INSERT INTO Age (dob, age) VALUES ('1996-12-08', 26);
INSERT INTO Age (dob, age) VALUES ('1992-03-30', 31);
INSERT INTO Age (dob, age) VALUES ('1989-08-06', 34);
INSERT INTO Age (dob, age) VALUES ('1997-06-14', 26);

Locations (arena: char(20), city: char(20))

INSERT INTO Locations (arena, city) VALUES ('Stadium A', 'New York');
INSERT INTO Locations (arena, city) VALUES ('Arena B', 'Los Angeles');
INSERT INTO Locations (arena, city) VALUES ('Coliseum C', 'Chicago');
INSERT INTO Locations (arena, city) VALUES ('Field D', 'Miami');
INSERT INTO Locations (arena, city) VALUES ('Center E', 'San Francisco');