**Part 1**: Use the following schema to answer the questions 1-3 below. This schema refers to a gaming organization. There can be any number of players per game. Each game and each tournament has one winner; if the game or tournament is ongoing, the winner is null. The gameWinner and tournamentWinner attributes are foreign keys for memberID.

Member (memberID, memberName, joinDate)

Game (gameID, gameType, gameDate, gameWinner, tournamentName)

MemberGame (memberID, gameID)

Tournament (tournamentName, tournamentWinner)

1. Write SQL queries to generate the following tables:
   1. The total number of ongoing tournaments.
   2. The average number of players per game of type Power Grid.
   3. The names (no duplicates) of all players Abigail Baker beat in any game.
   4. Each tournament name with the number of games in that tournament won by the tournament winner.
   5. A list of game IDs and game types sorted by game type then game id.
   6. A list of player IDs of all players who have played a game with the date of the first game played by that player.
2. Write a description of what each of the following queries does:
   1. SELECT \*

FROM Member LEFT OUTER JOIN Tournament ON memberID = tournamentWinner;

* 1. UPDATE Member

SET memberName = “Devon Chance”

WHERE memberID = 100154;

* 1. SELECT memberID, gameID

FROM Member NATURAL JOIN MemberGame NATURAL JOIN Game

WHERE joinDate < “2021-01-01” AND gameDate >= “2021-01-01”

1. Write two functionally different relational algebra statements equivalent to the query in 2c.

**Part 2**: Use the following relations to answer question 4.

R0 R1

|  |  |  |
| --- | --- | --- |
| a | b | c |
| 1 | 2 | 2 |
| 2 | 1 | 2 |
| 3 | 1 | 2 |

|  |  |  |
| --- | --- | --- |
| b | c | d |
| 1 | 2 | 3 |
| 2 | 4 | 7 |

1. For each of the following relational algebra expressions, draw the resultant relation in table form and write an equivalent expression in tuple relational calculus.

**Bonus**: Which of your answers to question 3 will most likely be processed faster? Justify your answer.