Problem Description:

Consider the following relation about cricket players during a season. The following table tracks the number of runs scored by the player. An instance of the table as it stands is given. Assume:
a.   No two players have the same name.
b.   A player can play against another team more than once but not on the same date. Further, a player plays only one game on any date
c.   A coach coaches only one team.
d.   Two teams can have a game against different opponents on the same date.
e.   Every player is given a number and no two players on the same team can have the same number. Two players on different teams can have the same number.

Player
(**PlayerName, PlayerState, PlayerNumber, PlayerTeam, TeamCoach, GameAgainst, GameDate, PlayerRuns**)

Sachin Tendulkar	Maharashtra	11	India	Greg Chappel	Pakistan	12/3/03	95
					Pakistan	25/3/03	22
					England	29/3/03	88
Adam Gilchrist	Western Australia	34	Australia	John Buchanan	S. Africa	10/3/03	42
					S. Africa	11/3/03	61
					New Zealand	12/3/03	62

For the following questions, explain your steps clearly.
1.   Is the relation in 1NF? Why or why not? If not, reduce the relation to 1NF.

Ans- The above relation is not in 1NF. As per the rule of 1NF, a column of a table cannot hold multiple values. It should hold only atomic(single) values.
Reducing the table into 1NF -

PlayerName	PlayerState	PlayerNumber	PlayerTeam	Coach	Game Against	GameDate	PlayerRuns
Sachin Tendulkar	Maharashtra	11	India	Greg Chappel	Pakistan	12/3/03	95
Sachin Tendulkar	Maharashtra	11	India	Greg Chappel	Pakistan	25/3/03	22
Sachin Tendulkar	Maharashtra	11	India	Greg Chappel	England	29/3/03	88
Adam Gilchrist	Western Australia	34	Australia	John Buchanan	S. Africa	10/3/03	42
Adam Gilchrist	Western Australia	34	Australia	John Buchanan	S. Africa	11/3/03	61
Adam Gilchrist	Western Australia	34	Australia	John Buchanan	New Zealand	12/3/03	62

2.   Using your knowledge of cricket and from the instance, identify the functional dependencies for this relation.

Ans- Functional Dependency is a constraint that determines the relation of one attribute to another attribute in a Database Management System (DBMS). A functional dependency is denoted by an arrow "→". The functional dependency of X on Y is represented by X → Y.

PlayerNumber ←PlayerName

PlayerNumber ←PlayerTeam

PlayerTeam ←Coach

PlayerTeam, PlayerName ←GameAgainst

PlayerNumber, PlayerTeam, PlayerName ←GameDate

PlayerNumber, PlayerTeam, PlayerName ←PlayerRuns

3.   Is the table you created in question 1 also in 2NF? If not decompose the relation into ones that are in 2NF.

Ans- A table is said to be in 2NF if it holds conditions:
a.   A table is in 1NF.
b.   All non-key attribute are fully functional dependent on the primary key.

Reducing the above table in 2NF-

Player Number	Game Against	Game Date	Players Runs
11	Pakistan	12/3/03	95
11	Pakistan	25/3/03	22
11	England	29/3/03	88
34	S. Africa	10/3/03	42
34	S. Africa	11/3/03	61
34	New Zealand	12/3/03	62

4.   Is/Are the table(s) you created in question 3 also in 3NF? If not decompose into 3NF.

Ans - A relation is said to be in 3NF if it is 2NF and no transitive dependency exists.
Reducing the above table in 3NF by dividing it into 2 tables,

Table1 has information about the PlayerName -

PlayerName	PlayerState	PlayerNumber	PlayerTeam	TeamCoach
Sachin Tendulkar	Maharashtra	11	India	Greg Chappel
Adam Gilchrist	Western Australia	34	Australia	John Buchanan

Table2 has information on matches-

PlayerNumber	PlayerTeam	GameAgainst	GameDate	PlayerRuns
11	India	Pakistan	12/3/03	95
11	India	Pakistan	25/3/03	22
11	India	England	29/3/03	88
34	Australia	S. Africa	10/3/03	42
34	Australia	S. Africa	11/3/03	61
34	Australia	New Zealand	12/3/03	62