

Task 1

Sport chosen: Golf

1. **The Basis of Golf**
 - a. **Ball**
 - b. **Clubs**
2. **Types of Golf**
3. **Stroke Play**
 - a. **Hole**
 - b. **Scorecard**
4. **Location**
 - a. **Golf Course**
5. **Actions**
 - a. **Swing**
 - b. **Foul**
6. **People Involved**
7. **Player Qualification and Disqualification**
8. **Conclusion**

Each member was given a topic to research. The rough research is included in the Research pdf which has been structured and summarized to answer task 1 down below.

The basis of golf

It is a ball-and-club sport. A player chooses a club from a variety and uses it to hit a small ball with the objective to sink the ball into a hole using a minimal amount of hits, known as strokes, as possible. The club chosen depends on how far the player desires the ball to travel through the course.

Ball

The ball has a 42.7 diameter and weighs 45.9g. It is mostly made of plastic and rubber, top with a tough skin.

Clubs

A player is only allowed 14 clubs in their club bag at a time out of a variety. The main clubs are:

- Drivers with an 11.5-degree loft, an average hit distance of 230 to 260 yards, a head weight of 200 grams, and a 44 inch shaft.
- Irons are categorised by numbers 1 to 10. The lofts range from 16 to 43 degrees, average hit distances ranging from 95 to 225 yards, head weights ranging from 230 grams to 286 grams, and shafts ranging from 35.5 to 39.5 inches
- Pitching wedge with a 47-degree loft, an average hit distance of 80 to 120 yards, a head weight of 293 grams, and a 35.5 inch shaft.

- Putter. A club only used on the green. Club available with a heel, centered and hosel offset.

More varieties of clubs are available for the players to use.



Types of golf

There are a multitude of ways in which golf can be played. It can be played in teams or by individual players. The number of holes played is not fixed but depends on the type of golf played. These different types also influence how an individual or team's score is determined. In match play, for example, each hole is played in isolation with there being a winner or a tie. The player/team to have won the most holes will have won the game. While in stroke play, the holes are not played in isolation and the total score determines the winner. There is scramble, with a team playing with multiple balls and relying on the best shot, and alternate shot, where a team take turns to hit a single ball. There is gross play, where a player's score is not adjusted, and handicap play, where a player's score is adjusted according to the player's handicap—the player's abilities – for a fairer game.

Team import javax.teamMadness has limited the chosen sport to a single-player stroke play that does NOT consider handicap.

Update! Chosen sport: Golf Single-player Stroke play (gross)

Stroke play (medal play)

Stroke play is a popular and professional form of golf. It is played in championships such as the PGA, the U. S Open, the British Open, the Masters Tournament, and more.

In stroke play, a player's score is equal to the total strokes on all holes. Every stroke counts until the ball is sunk. This includes unsuccessful strokes such as air-balls – when a player swings but misses the ball—or hazard balls. Each hole's total is written on a player's scorecard.

Stroke play is limited to 18 holes in a game. There are, however, reasons for holes not being played such as weather, player illness, and match ending before the last holes are reached. For scores to be acceptable in these cases a minimum of 14 holes needs to have been played.

The number of players in a single match is not fixed, however, is kept small for golf stroke play is a long game. A single match can be split into multiple as players need not play the same match to compete.

Team import javax.teamMadness has limited the number of players participating in a single event to 5. It will not be a tournament but an event with a winner determined at the end of the game. As

stroke play is the chosen golf type, the player with the lowest stroke total is considered is the winner.

Hole

A golf hole has a regulated diameter of 108 mm and a depth of 101.6-152.4 mm. Each hole has a par, which is a predetermined number of strokes a first-class golf player should aim not to exceed when playing the hole. The par is determined by the difficulty of the hole and the distance the hole is from the tee (starting position), known as the effective playing length.

Par	Men	Women
3	0-250 yards	0-210 yards
4	251-470 yards	211-400 yards
5	471-690 yards	401-575 yards
6	+691 yards	+576 yards

Scorecard

The scorecard is a record each player has per event. It is updated after each hole is played. The scorecard records the hole and the number of strokes the player took to sink the ball into the hole. If handicaps are considered, the scorecard would include this information.

Scoring Term per hole	Explanation
Birdie	One stroke under par on an individual hole
Eagle	Two strokes under par on an individual hole
Albatross/ Double eagle	Three strokes under par on an individual hole
Condor	Four strokes under par on an individual hole
Ace/Hole-in-one	Getting the ball in the hole in only one stroke
Bogey	One stroke over par on an individual hole
Double Bogey	Two strokes over par on an individual hole
Triple Bogey	Three strokes over par on an individual hole
Quadruple Bogey	Four strokes over par on an individual hole

Location, Date and Time

Golf is a physical sport played on a golf course. A single event is played in a single day with no fixed time limit. Although night golf is plausible and is played on floodlit courses, it is rare and so all events will be limited to the daytime.

Golf Course

There are a variety of golf courses. Team import javax.teamMadness has chosen 18 hole stroke play and so the golf course the events will take place on are 18 hole golf courses.

Golf courses vary in difficulty(slope rating).

The main types of golf courses are:

- 'Link' golf courses are very natural with little to no trees and found near coastal areas

- 'Park land' golf courses are found in land with lots of trees and manicured, lush, constructed grass
- 'Desert' golf courses are found in areas with arid climates
- 'Heathland' golf courses are found inland with a few pine trees and course grass

18 hole golf courses averages at 160-190 acres. Most golf course land consists of:

- The teeing areas. Closely mowed grass area where players start for each hole. There are 4 tees for each hole with varying distances from the hole, with red being the closest to the hole and black (blue-furthest) being the furthest from the hole which will be the tee area the players will use in the events. Players use a tee, which is a small pick-like stand the player uses to elevate the ball.
- The fairway. The mown stretch of land between the tee and the hole. The grass on the fairway is constantly maintained and is cut extremely short to allow for easier hitting
- The rough which is an area of tall and unmaintained grass which serves the purpose of punishing a player for lack of accuracy hence making it more difficult to hit.
- The hazards which are in and around the fairway. These consist of sand bunkers, ponds, and bushes. A ball landing in a hazard does not result in penalty but makes it hard for a player to hit the ball leading to a penalty stroke for out of bounds areas such as water hazards. Penalty strokes are when a player will need to drop their ball next to the hazard and continue playing. This counts as an extra stroke for hitting their ball out of bounds.
- The putting green. The trimmed grass area where the hole is located and is indicated with a flag.

Actions

Swing

An event of golf consists mostly of swings to hit a ball. A player's swing influenced by a multitude of factors such as the distance and trajectory the player wishes to send the ball, the environmental conditions such as wind and land(rough, fairway, hazards), the club used to take the hit and minute details known by first class players such as angle of attack, etc.

Fouls

The first and most common penalty involves the hazards on the course. If a player's ball lands in a hazard they are required to take a 'drop'. A 'drop' is when a player drops a new ball on the nearest playable location near the involved hazard. This action will result in a penalty stroke.

The second penalty is not an action but the player violating equipment regulation(clubs and balls are not within the required dimensions and weights). A 2 stroke penalty will be enforced for each hole the player has played up until the discovery of the violation.

People involved

Referee/ Rule official

The referee enforces the rules throughout the game. They regulate the scorecards and update the scoreboard accordingly. The referee writes a report of the match (scores, disqualification) and submits it to the event managers.

Commentators

They observe and commentate on the match. They inform the audience about the course statistics, and player statistics for a more immersive viewing.

Golf Coaches

They are golf specialists who train the golfers. They ensure a golfer is ready for the match. Coaches create game plans and strategies for golfers.

Course Manager

Manages the golf course as well as the staff and makes sure everyone on the course is satisfied and happy with the services offered on the course.

Caddie

A caddie is a person who carries the golfers' clubs. The carry also gives the player course statistics such as slope rating, course obstacles. The caddie usually walks ahead to locate the golfer's next hole and helps in locating a ball after a swing. A golf cart is often driven by the caddie to quicken the travel across the course.

Player/ Golfer

A golfer is a person who plays golf. To be considered as a pro golfer one must be licenced under the PGA (Professional Golf Association). The player's level is measured by handicaps, which is calculated by examining previous matches. The lower the handicap the better the golfer. Professional golfers with a handicap of 0 are known as scratch golfers.

Player Qualification and Disqualification

An example of player **qualifications** for PGA:

- Participants must be at least 18 years of age.
- Participants must have matriculated with suitable qualifications, especially in literacy sciences and math.
- Have at least a 5 handicap for men and an 8 handicap for women or lower.
- Participants must be employed by a full PGA member in a green grass environment (golf club or driving range).

SportsML does not focus on any specific event/tournament regarding a sport. It can represent local events and championships and so player qualifications should not be fixed. Team import `javax.teamMadness` has decided to not consider a player's qualification when added to an event.

Disqualifications

A player can be disqualified for one of the following reasons:

- Turning in an incorrect or unsigned scorecard.
 - The score is lower than the strokes taken on a hole.
 - The player has not signed scorecard.
 (If a player's score is higher than the stroke count the player will not be disqualified, but will take the higher score.)
- Misrepresentation of handicaps.
- Missing starting time.
 (If a player arrives within 5 minutes a 2 stroke penalty will be enforced rather than disqualification)

In conclusion, a single event will consist of five players. Tee times will be used when players start playing at different times rather than using a shotgun approach where players play simultaneously but at different holes throughout the course. The players then attempt to sink the ball into the hole with the lowest number of strokes. The total strokes will be determined at the end of the game and the player with the lowest stroke total wins.

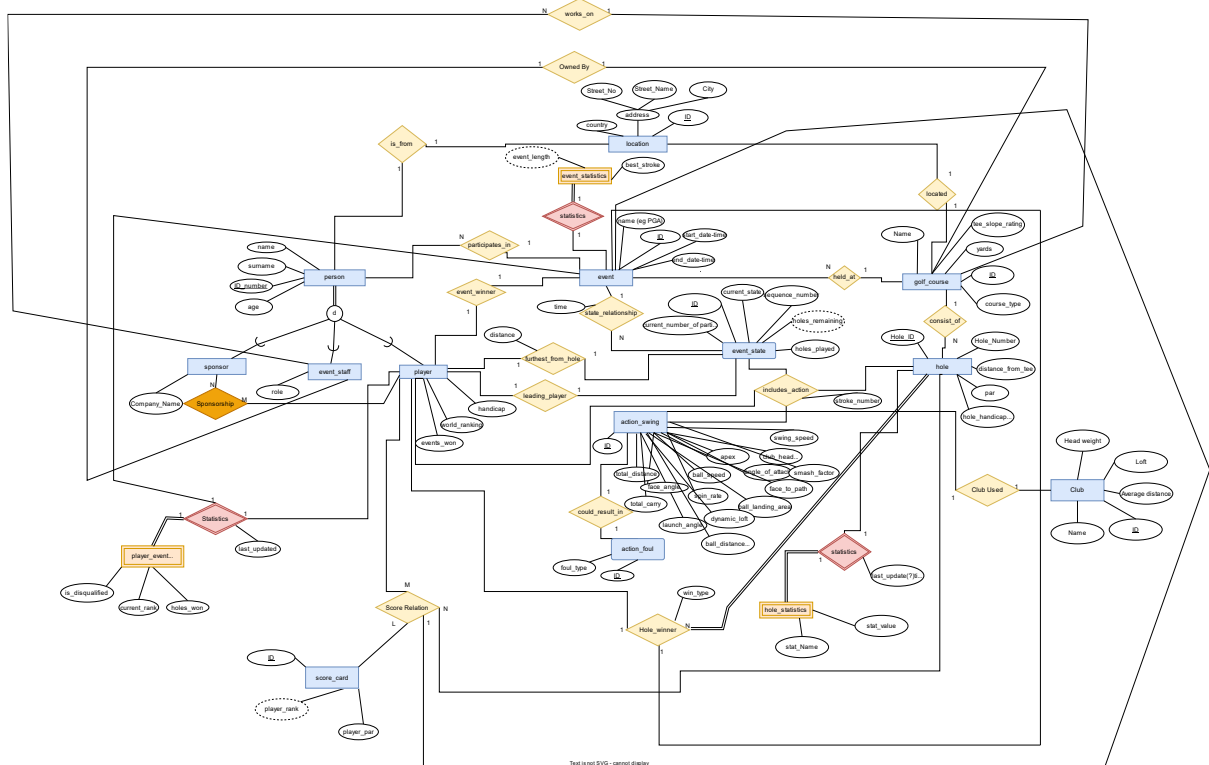
There is no tournament structure but a ranking structure. Each player's individual scores will be tallied and used to determine the player rankings at the end of each event.

Task 2

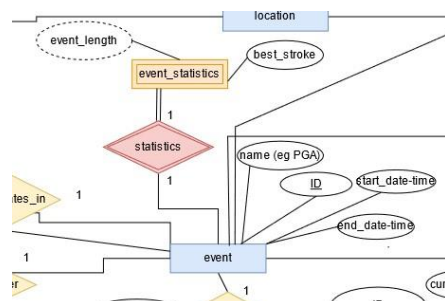
The link below contains all iterations made in designing the EER diagram

[https://app.diagrams.net/#Himport-javax-teamMadness%2FCOS221PA5%2Fmain%2FE\(E\)R%20Diagrams%2FCOS%20221%20-%20PA5%20\(E\)ER%20Diagram%20v1.drawio.html](https://app.diagrams.net/#Himport-javax-teamMadness%2FCOS221PA5%2Fmain%2FE(E)R%20Diagrams%2FCOS%20221%20-%20PA5%20(E)ER%20Diagram%20v1.drawio.html)

Final EER Diagram:



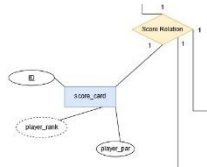
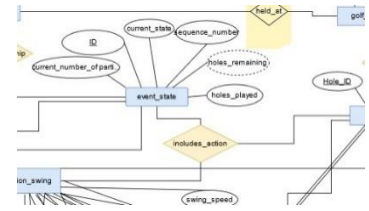
The sport structure does not include a tournament but isolated events with the players' end scores tallied to form a ranking system. Because of this the team has excluded the tournament entity from the EER diagram and focused on event.



The event entity includes attributes such as name, date-time, and ID to enable identification. It has a relationship with weak entity type, event_statistics and player_event_statistics. As the structure is limited to stroke play, we have excluded statistics relating to other forms of golf. Other statistics relating to event can be derived from its relationships such as hole_winner (to player), held_at(golf_course), participants(to person), and the relationship to event_state.

Although the person structure is already included in the sportsML we have included and altered it to fit our model.

Event_state, a generic structure in the sportsML, altered to fit our chosen sport. It is linked to a single action which is swing. Each event_state is linked to the hole(period, round) the action is taking place in and the player involved. Event_state allows for in-game statistics to be captured such as player furthest from the hole, leading player and holes played.



The scorecard entity will represent the player's score on each hole. Instead of having an entity with 18 more attributes to hold the player's score on each of the 18 holes or having a 1:1:N(player: scorecard: hole) cardinality, we have chosen a 1:1:1 for a straightforward and simple relationship.

The media entity was not included in the EER diagram as it is already provided in the sportsML model. It will be able to store media associated with events, players, and golf courses.

Task 3

The complete relational mapping is in the file Relational Mapping.pdf

Step 1: Mapping of Strong Entity Types

Person:			The simplified version of the sportsDB persons table. (will use the sportsDB in database)
<u>ID_Number</u>	Name	Surname	

Location:				
<u>Location_ID</u>	Street_No	Street_Name	City	Country

Event:			
<u>ID</u>	Name	Start_DTime	End_DTime

Event_State:					
Event State ID	Time	Current no participants	Current State	Sequence Number	Holes Played

Action_Swing:															
Swing_ID	Total_carry	Face_angle	Launch_angle	Distance_from_hole	Dynamic_Loft	Spin_rate	Ball_Speed	Apex	Ball_Landing_Area	Face_to_path	Angle_of_attack	Smash_factor	Club_head_Speed	Swing_speed	Total_Distance

Hole:			
Hole ID	Hole Number	Distance from tee	Par

Score Card:	
Score Card ID	Player_par

Club:				
Club ID	Club Name	Average Distance	Loft	Head weight

Action_Foul:	
Action Foul ID	Foul Type

Step 8: Mapping Generalisation and Specialisation

First approach:

Sponsor:				Person superclass
<u>Sponsor_ID(fk)</u>	Company_name			
Staff:				Person superclass
<u>ID Number(fk)</u>	role			
Player:				Person superclass
<u>ID Number (fk)</u>	Events won	World_ranking	Handicap	

Step 2: Mapping of weak entity types

Hole_Statistics:															Owned by Hole		
<u>Hole_ID (fk)</u>			<u>Statistic_Name</u>					<u>Stat_value</u>									
Player_Event_Statistics:															Owned by Player and Event		
<u>Event_ID</u>		<u>Player_ID Number</u>			<u>Current_status</u>			<u>Is_disqualified</u>		<u>Holes_won</u>		<u>Last_Updated</u>					
Event_Statistics:															Owned by Event		
<u>Event_ID</u>			<u>Best_stroke</u>			<u>Money_won</u>											
Step 3: Mapping binary 1:1 relations																	
Foreign key approach:																	
Person:															Foreign key to location		
<u>ID_Number</u>		<u>Name</u>		<u>Surname</u>		<u>Is_From(fk)</u>											
Golf_Course:															Foreign key to location and person		
<u>Golf_Course_ID</u>		<u>Name</u>		<u>yards</u>		<u>Owner-ID(fk)</u>		<u>Course_Type</u>			<u>Location_ID (fk)</u>						
Event_Statistics:															Foreign key to player		
<u>Event_ID</u>			<u>Best_stroke</u>			<u>Money_won</u>											
Action_Foul:															Foreign key to Action_swing		
<u>Action_Foul_ID</u>		<u>Foul_Type</u>			<u>Action_Swing_ID(fk)</u>												
Action_Swing:																	
<u>Swing_ID</u>	To tal_carry	Fa ce_angle	Lau nch_angle	Dista nce_from_hole	Dyn amic_Loft	Spi n_rate	Bal l_Speed	Ap ex	Ball_Lan d ing_Area	Face_to_path	Angle_of_attack	Sm ash_factor	Club_he ad_Speed	Swi ng_speed	To tal_Distance	Club_us ed (fk)	
Foreign key to club																	
Cross reference approach: Choice for this approach is so that the following tables can be used as lookups																	
Player_Furthest_From_Hole:										Foreign key to player and event state							
<u>Event_State_ID (fk)</u>		<u>Player_ID(fk)</u>			<u>Distance</u>												
Leading_Player:										Foreign key to player and event state							
<u>EventState_ID</u>		<u>Player_ID</u>															
Step 4: Mapping 1:N binary relations																	
Foreign key approach:																	
Event_Staff:													Foreign key to golf course for works on				
<u>ID_Number(fk)</u>		<u>Role</u>			<u>WorksCourse_ID(fk)</u>												
Hole:													Foreign key to golf course				
<u>Hole_ID</u>		<u>Hole_Number</u>		<u>Golf_Course_ID(fk)</u>			<u>Distance_from_tee</u>			<u>Par</u>							
Event_State:																	
<u>Event_State_ID</u>		<u>Event_ID(fk)</u>		<u>Time</u>		<u>Current_no_participants</u>			<u>Current_State</u>		<u>Sequence_Number</u>			<u>Holes_Played</u>			
Foreign key of Event for state-relationship																	
Cross reference approach: Choice for this approach is so that the following can be used as lookups and to avoid redundant data																	

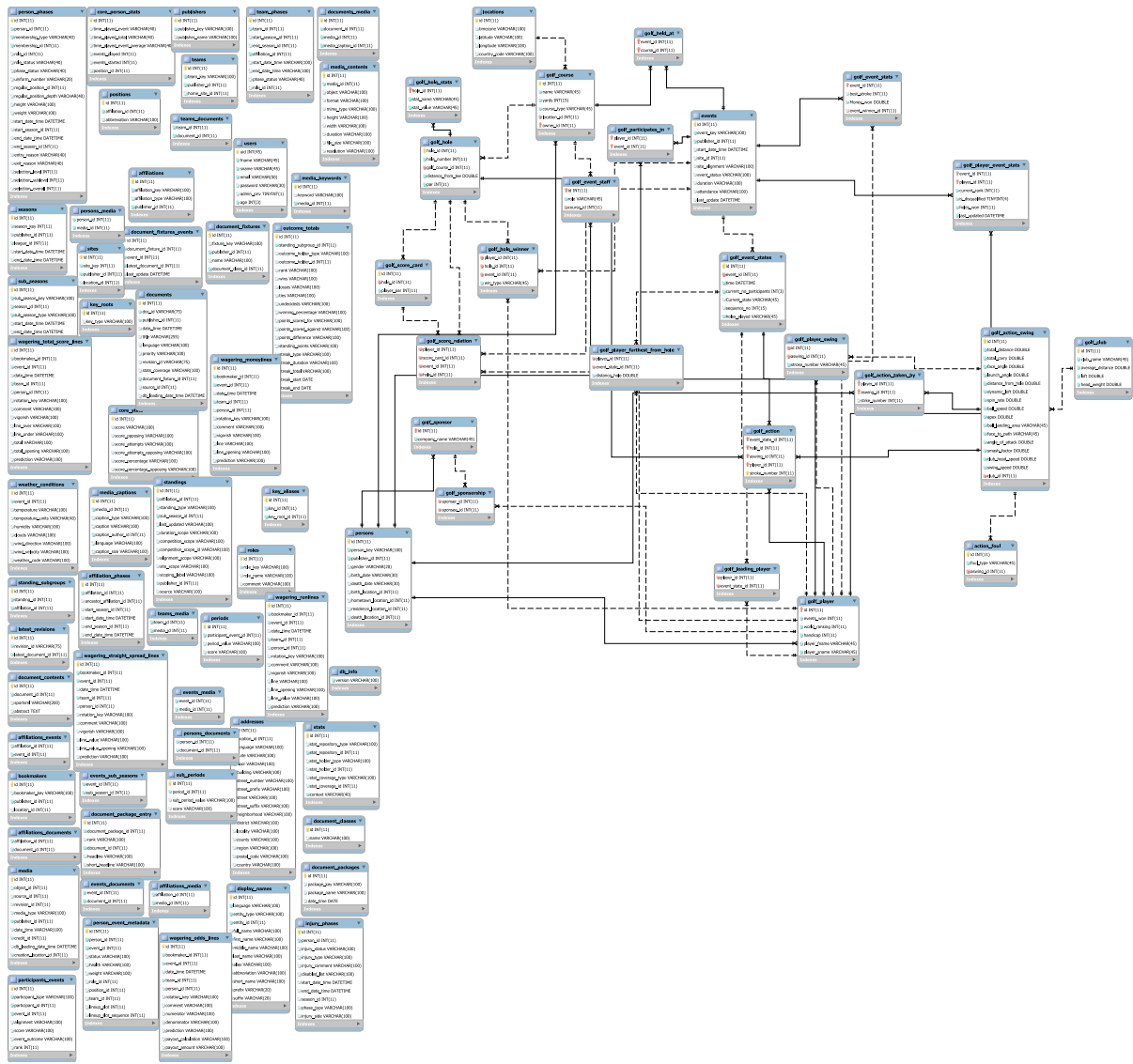
Held_At:			Foreign key to golf course and event		
<u>Golf_Course_ID(fk)</u>	<u>Event_ID(fk)</u>				
Participates_in:			Foreign key to person and event		
<u>Person_ID(fk)</u>	<u>Event_ID(fk)</u>				
Step 7: Mapping of N-ary relationships:					
Hole_Winner:				Foreign keys to hole, player, event	
<u>Hole_ID(fk)</u>	<u>Player_ID(fk)</u>	<u>Event_ID(fk)</u>	<u>Win_type</u>		
Score_relation:				Foreign keys to hole score card player and event	
<u>Hole_ID(fk)</u>	<u>Score_Card_ID(fk)</u>	<u>Player_ID(fk)</u>	<u>Event_ID(fk)</u>		
Action:					Foreign keys to event state, player, hole, action swing
<u>Event_State_ID(fk)</u>	<u>Player_ID(fk)</u>	<u>Hole_ID(fk)</u>	<u>Action_Swing_ID(fk)</u>	<u>Stroke_Number</u>	

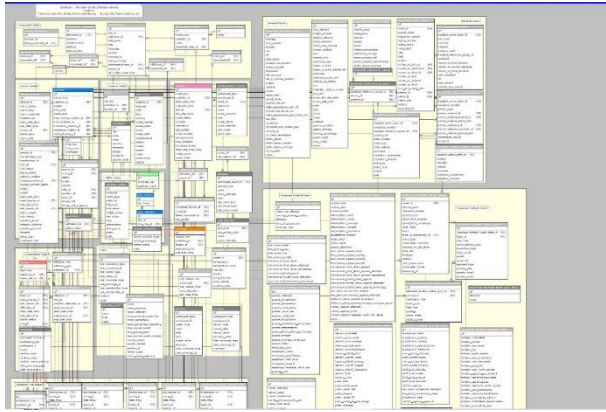
Task 4

The visual diagram is included as a pdf, png, and svg in the zip file submitted for better viewing

Key legend used to represent the primary key, foreign key and constraints:

- Key: (Part of) Primary Key
 - Filled Diamond: NOT NULL
 - Not filled Diamond: NULL
 - Red coloured: (Part of) Foreign Key
 - Blue lined Diamond: Simple attribute
- Can be combined for example:
- is a Red coloured Key so it's a Primary Key which is also a Foreign Key
 - is a Yellow (non Red) Key so it's only a Primary Key
 - is a blue lined filled diamond so it's a NOT NULL simple attribute
 - is a red coloured filled diamond so it's a NOT NULL Foreign Key
 - is a blue lined not filled diamond so it's a simple attribute which can be NULL
 - is a red coloured not filled diamond so it's a Foreign Key which can be NULL





The relational database extension was designed according to the SportsDB modal. The default sports were removed and the golf tables incorporated into the database. (most of the links(foreign key representations were not included in the visual diagram as were not needed in the UI functionality but are present in the dump file).

The dump is included in the zipped folder submitted allow with the readme.txt file