
GYM PROGRESS TRACKER DATABASE

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T-SQL PROJECT REPORT

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Executive Summary

Brief overview of the project

This database manages aspects of gym operations such as member registration, attendance tracking, and payment transactions. It also monitors members' progress through attributes such as calorie intake, height, and weight for effective fitness management. Furthermore, it keeps track of trainer assignments and equipment usage, that can aid in determining training insights and optimizing the overall gym experience.

Key findings and conclusions

This database project enables the successful creation of a relational database system for gym fitness centers. Firstly, the authors found that 6 tables/relations are needed after translating the ERD to a relational schema. Originally, the conceptual model only has 5 entities, and 1 new relation is formed due to the existence of many-to-many relationship between the member and equipment entities. Database objects are then created including 6 tables, 3 functions, 6 views, 7 stored procedures, and 3 triggers. Furthermore, 4 users are created: Admin, Member, Trainer, and Finance Staff. Lastly, the authors achieved to display the database records using a front-end GUI with the use of python.

This database project became an avenue for the authors to increase their proficiency in Database Design and SQL, as well as their skill in technical documentation of a database project.

The implemented gym progress tracker relational database is thoroughly described in this report, as well as detailed recommendations for future work.

1. Introduction

Purpose of the project

The purpose of this project is to create a database system for gym centers that will primarily keep track of the fitness progress of its members. In addition, this project will help in managing member registration and payment, attendance, gym equipment and usage records, and trainer assignments. By monitoring and keeping track of all these data, this database project can give substantial information that will aid in the maintenance scheduling of the gym facility and equipment, and in the optimization of trainer-trainee allocation. Furthermore, it can also help in simplifying administrative tasks such as easy access to identifying membership status and doing payment transactions.

Upon implementation in gym or fitness centers, this project targets to streamline the gym operations, potentially increasing the gym goers – thus, increasing sales and profit. And most importantly, this project aims to further improve the members' fitness, health, and overall well-being.

Scope of the report

This report describes the comprehensive steps and actions completed for the 3-part assignment of this project which includes: database design, database programming, and database querying.

In the database design section, the report shows the Entity-Relationship Diagram (ERD) and the business rules to be followed for the database structure. The ERD follows the UML notation instead of the crow's foot notation or Chen's notation. In the database programming section, the report includes the SQL DDL scripts along with their explanations which translates the conceptual model into a relational schema. The scripts are executed using Microsoft SQL Server Management Studio. In the database querying section, the report focuses on creating the database objects such as views, stored procedures, functions, and triggers. All these objects are explained in detail in the report.

Lastly, this report includes the PowerPoint Presentation file and a YouTube video link as demonstration of the project. It involves the execution of the SQL codes alongside the demonstration of a front-end GUI.

2. Database Design

2.1 Conceptual Design

2.1.1 Conceptual Model as ERD

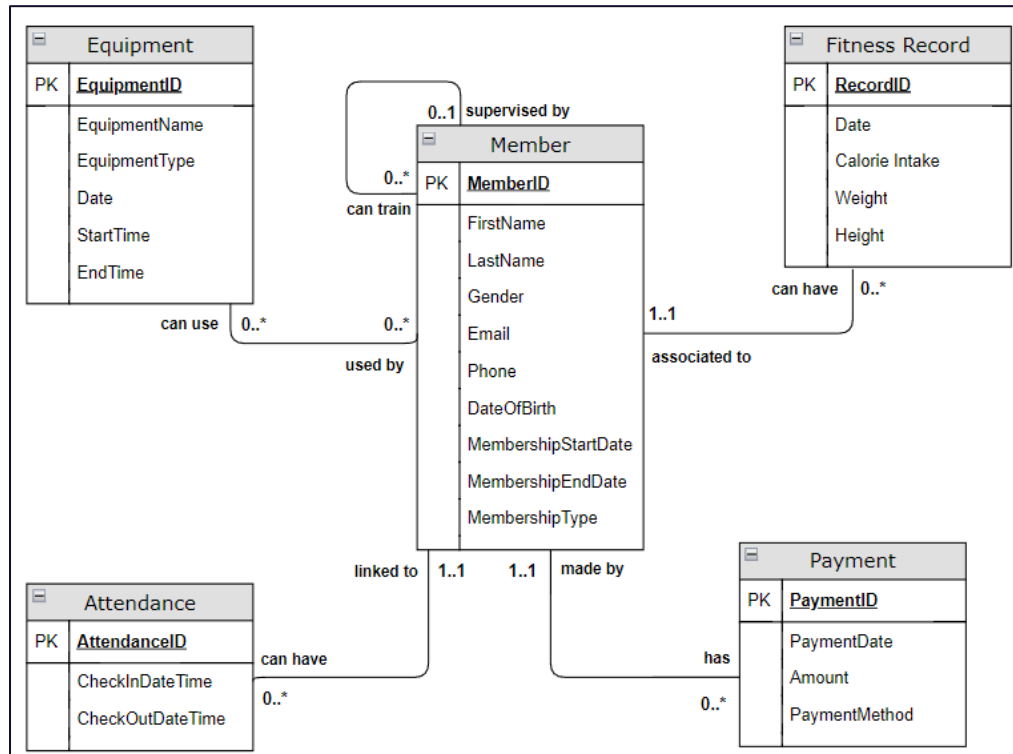


Figure 1. Conceptual Model (Created using draw.io).

This conceptual model is designed to satisfy the business requirements listed in the following section. It displays the relationships and cardinalities between the entities following the UML notation.

2.1.2 Business Rules

1. Each member may be supervised by a trainer.
2. Each member has zero or many payment records.
3. Each member has zero or many payment records.
4. Each payment record is made by one and only one member.
5. Each attendance record is linked to one and only one member.
6. Each member can have zero or many attendance records.
7. Each fitness record is associated to one and only one member.
8. Each member can have zero or many fitness records.
9. Each gym equipment can be used by zero or many members.
10. Each member can use zero or many gym equipment once per day.

2.2 Relational Model

2.2.1 Relational Schema Description

The ER model to relational schema mapping will involve the conceptual model presented in [Figure 1](#) to be transformed into a set of relational tables in accordance with the seven (7) step algorithm for converting regular ER models.^[1]

For the 1st step, each strong entity is converted to a relation. All the attributes of the entity become the attributes of the relation. This also includes the key attributes of the entity which become the Primary Keys (PK) of the relation, which are represented with underline. A total of 5 entities are converted into relations: Fitness Record, Attendance, Member, Payment, and Equipment. For the 2nd step, no weak entities are present from the ER model and thus no conversion is necessary. For the 3rd step, no 1:1 relationships are present and thus no action is needed. For the 4th step, 1:N relationships are converted which involves adding Foreign Keys (FK) to the relation on the N-side of every relationship, which are represented with bold font. Fitness Record will contain the FK MemberID, Attendance will contain the FK MemberID, Member will contain the FK TrainerMbrID for the recursive relationship, and Payment will contain the FK MemberID. For the 5th step, M:N relationships are converted into a new relation. The Equipment Usage is a new relation formed which will contain the FKs EquipmentID and MemberID. The PKs of this new relation will also be EquipmentID and MemberID, also with the addition of UsageDate to satisfy the business requirement [#10](#). For the 6th step, there are no multi-valued attributes, so no conversion is necessary. Finally for the 7th step, there are no n-ary relationships from the conceptual model therefore, so no conversion is needed.

After following the straightforward algorithm for converting regular ER model to relational schema, the final diagram is made and displayed in [Figure 2](#). This set of relational tables are now ready to be implemented in a relational database management system (RDMS).

For this project, Microsoft SQL Server is used and a generated relational schema from this RDBMS is displayed in [Figure 3](#).

2.2.2 Relational Schema Diagram

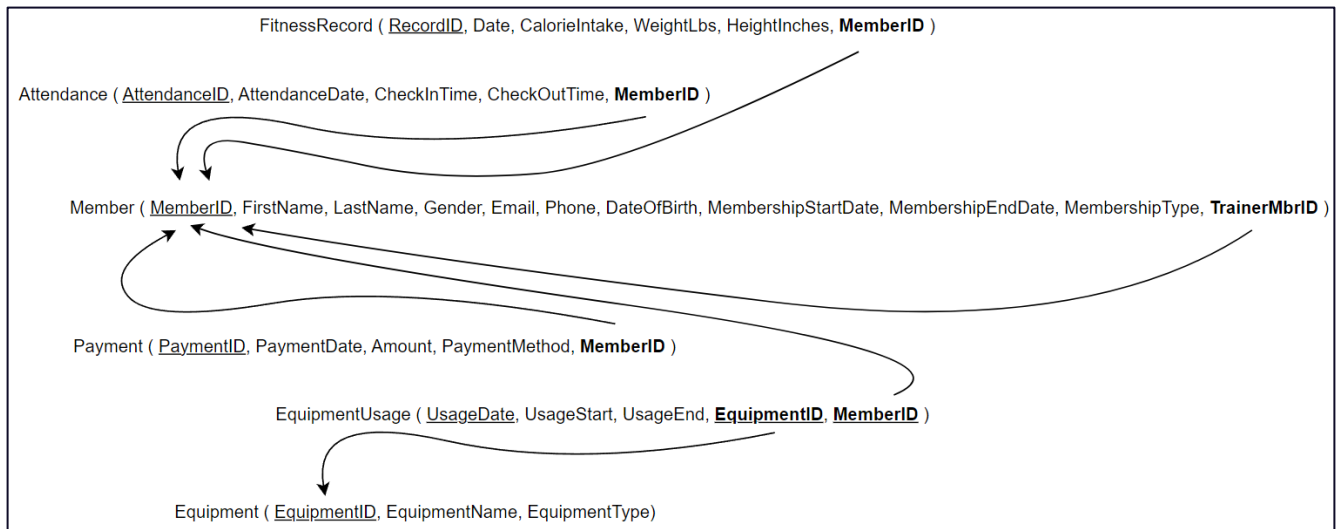


Figure 2: Relational Schema (Created using draw.io).

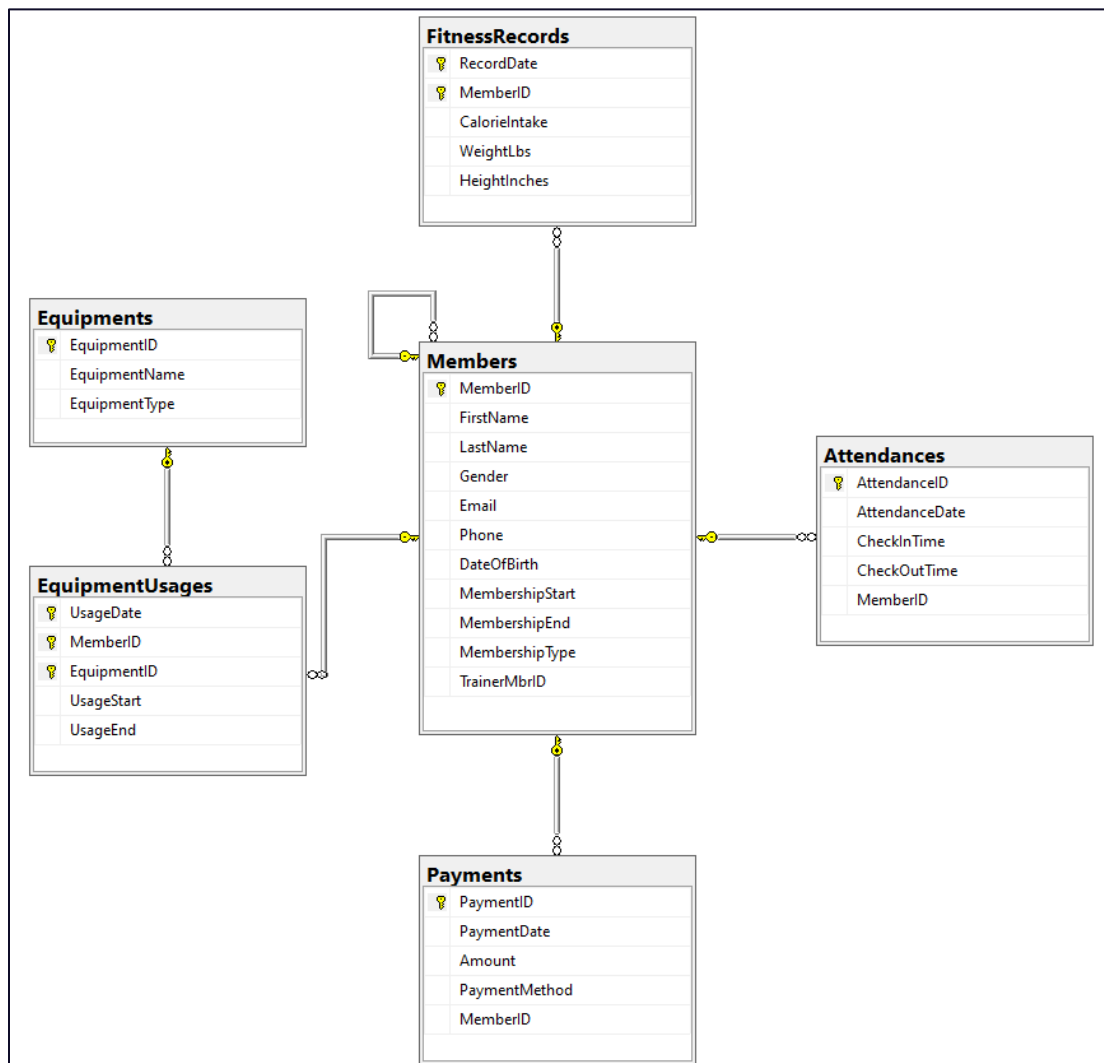


Figure 3. Relational Schema (Generated using Microsoft SQL Server Management Studio).

3. Database Programming

3.1 Database Schema Definition

3.1.1 SQL DDL Scripts

```
-- Step 1: Use master
USE master
GO

-- Step 2: Drop the GymProgressTracker database if it already exists
IF DB_ID('GymProgressTracker') IS NOT NULL
    DROP DATABASE GymProgressTracker
GO

-- Step 3: Create the database
CREATE DATABASE GymProgressTracker
GO

-- Step 4: Use the newly created database
USE GymProgressTracker
GO

-- Step 5: Confirm to standards
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO

-- Step 6: Create tables and add constraints (PK, NULLs, Checks, etc)
-- Create the Members table
CREATE TABLE Members (
    MemberID          INT IDENTITY(1,1)    NOT NULL,
    FirstName         NVARCHAR(50)         NOT NULL,
    LastName          NVARCHAR(50)         NOT NULL,
    Gender            CHAR(1)              NOT NULL,
    Email             NVARCHAR(50)         NULL,
    Phone             NVARCHAR(20)         NOT NULL,
    DateOfBirth       DATE                 NOT NULL,
    MembershipStart   DATE                 NULL,
    MembershipEnd     DATE                 NULL,
    MembershipType    NVARCHAR(10)         NULL,
    TrainerMbrID      INT                  NULL,
    PRIMARY KEY (MemberID),
    CHECK (Gender = 'M' OR Gender = 'F'),
    CHECK (MembershipType = 'Standard' OR MembershipType = 'Premium')
)
GO

-- Create the Payments table
CREATE TABLE Payments (
    PaymentID         INT IDENTITY(1,1)    NOT NULL,
    PaymentDate       DATE                 NOT NULL,
    Amount            MONEY                 NOT NULL,
    PaymentMethod     NVARCHAR(50)         NOT NULL,
    MemberID          INT                  NOT NULL,
    PRIMARY KEY (PaymentID),
    CHECK (Amount = 50 OR Amount = 100),
    CHECK (PaymentMethod IN ('Cash', 'Debit Card', 'Credit Card'))
)
```



```

GO
-- Create the Attendances table
CREATE TABLE Attendances (
    AttendanceID      INT IDENTITY(1,1)    NOT NULL,
    AttendanceDate    DATE                  NOT NULL,
    CheckInTime       TIME                  NOT NULL,
    CheckOutTime      TIME                  NULL,
    MemberID          INT                  NOT NULL,
    PRIMARY KEY (AttendanceID)
)
GO
-- Create the Equipments table
CREATE TABLE Equipments (
    EquipmentID       INT IDENTITY(1,1)    NOT NULL,
    EquipmentName     NVARCHAR(50)         NOT NULL,
    EquipmentType     NVARCHAR(50)         NOT NULL,
    PRIMARY KEY (EquipmentID)
)
GO
-- Create the EquipmentUsages table
CREATE TABLE EquipmentUsages (
    UsageDate         DATE    NOT NULL,
    MemberID          INT     NOT NULL,
    EquipmentID       INT     NOT NULL,
    UsageStart        TIME    NOT NULL,
    UsageEnd          TIME    NULL,
    -- Member can use each equipment once per day:
    -- MemberID + UsageDate + EquipmentID must be unique
    PRIMARY KEY (UsageDate, MemberID, EquipmentID)
)
GO
-- Create the FitnessRecords table
CREATE TABLE FitnessRecords (
    RecordDate        DATE                  NOT NULL,
    MemberID          INT                  NOT NULL,
    CalorieIntake     DECIMAL(10,2)        NOT NULL,
    WeightLbs         DECIMAL(10,2)        NOT NULL,
    HeightInches      DECIMAL(10,2)        NOT NULL,
    PRIMARY KEY (RecordDate, MemberID)
)
GO
-- Step 7: Add Foreign Key constraints
-- For the Members table
ALTER TABLE Members
ADD CONSTRAINT fkMembersMbrID FOREIGN KEY (TrainerMbrID) REFERENCES Members(MemberID);
-- For the Payments table
ALTER TABLE Payments
ADD CONSTRAINT fkPaymentsMbrID FOREIGN KEY (MemberID) REFERENCES Members(MemberID);
-- For the Attendances table
ALTER TABLE Attendances
ADD CONSTRAINT fkAttendancesMbrID FOREIGN KEY (MemberID) REFERENCES Members(MemberID);
-- For the EquipmentUsages table
ALTER TABLE EquipmentUsages
ADD CONSTRAINT fkEquipUsagesMbrID FOREIGN KEY (MemberID) REFERENCES Members(MemberID),
    CONSTRAINT fkEquipUsagesEqID FOREIGN KEY (EquipmentID) REFERENCES Equipments(EquipmentID);
-- For the FitnessRecords table
ALTER TABLE FitnessRecords
ADD CONSTRAINT fkFitnessRecordsMbrID FOREIGN KEY (MemberID) REFERENCES Members(MemberID);

```

3.1.2 SQL Code Explanation

The SQL DDL Scripts in [3.1.1](#) are used to define the database schema of this project. A total of seven (7) steps are followed and considered for these SQL Scripts in creating the GymProgressTracker database.

For the 1st step, the script switches to the master database. This is done to ensure the main or home location before creating a new database from scratch. For the 2nd step, the script checks if the GymProgressTracker database already exists. If so, the existing database is dropped or deleted to avoid any potential issues that may arise from the creation of the brand-new database. For the 3rd step, the script does the actual creation of the GymProgressTracker database. This database will store all the gym-related data about this project. For the 4th step, the script switches to the newly created GymProgressTracker database. This is done to ensure the correct location before executing the subsequent SQL commands. For the 5th step, the script enables settings for ANSI Nulls and Quoted Identifier standards that will help in writing consistent and portable SQL code. For the 6th step, the script creates the different tables that will be used for this project. There are six (6) tables that are defined in this step along with their corresponding columns, data types, NULL/NOT NULL constraints, CHECK constraints, and their Primary Keys. And finally for the 7th step, the script establishes the links and references between the tables by adding the Foreign Key constraints. This is to ensure the relationships between tables and as well as to ensure the data and referential integrity within the database.

After execution of all the 7 steps from the SQL DDL Code, the database schema of this project is now created. It contains the appropriate data types, constraints and indexing needed as well as the definition of primary keys and foreign key relationships. Coding conventions are also followed such as adding comments which clearly explains each script. Sample data are ready to be inserted into the tables of the GymProgressTracker database. The SQL DML Code for the insert statements are included in [Appendix A](#) and it will be also attached as a separate file due to the huge number of lines. Random member names and information are generated from Mockaroo^[5] and are designed by purpose to properly show the database functionalities. Users with different privileges are also created in Microsoft SQL Server using the Database Security material^[4] and are shown in [Appendix C](#).

4. Database Programming and Querying

4.1 Creation of Database Objects

4.1.1 SQL Code for Views with Explanation

All the views in this project are created with the Database Object I materials^{[6][7]} used as reference. Coding conventions and best practices such as commenting and adding the prefix “vw” is followed.

```
-- View #1: vwMemberInitialWeight (Member View)
CREATE VIEW vwMemberInitialWeight
AS
    SELECT fr.MemberID, fr.RecordDate, fr.WeightLbs
    FROM FitnessRecords fr
    INNER JOIN (
        SELECT MemberID, MIN(RecordDate) AS InitialRecordDate
        FROM FitnessRecords
        GROUP BY MemberID) AS initialfr
    ON fr.MemberID = initialfr.MemberID AND fr.RecordDate = initialfr.InitialRecordDate;
GO
```

Explanation: This view displays the initial weight of members that are with existing fitness record.

```
-- View #2: vwMemberLatestWeight (Member View)
CREATE VIEW vwMemberLatestWeight
AS
    SELECT fr.MemberID, fr.RecordDate, fr.WeightLbs
    FROM FitnessRecords fr
    INNER JOIN (
        SELECT MemberID, MAX(RecordDate) AS InitialRecordDate
        FROM FitnessRecords
        GROUP BY MemberID) AS latestfr
    ON fr.MemberID = latestfr.MemberID AND fr.RecordDate = latestfr.InitialRecordDate;
GO
```

Explanation: This view displays the latest weight of members that are with existing fitness record.

```
-- View #3: vwMemberInitialVsLatest (Member View) - (View #1+2)
CREATE VIEW vwMemberInitialVsLatest
AS
    SELECT i.MemberID,
        i.RecordDate AS InitialRecordDate, i.WeightLbs AS InitialWeightLbs,
        l.RecordDate AS LatestRecordDate, l.WeightLbs AS LatestWeightLbs
    FROM vwMemberInitialWeight i
    INNER JOIN vwMemberLatestWeight l
    ON i.MemberID = l.MemberID;
GO
```

Explanation: This view displays the initial and latest weight of members with existing fitness record. It is basically a combination of view #1 and #2.

```
-- View #4: vwMemberLatestStatus (Member View)
CREATE VIEW vwMemberLatestStatus
11
```

```

AS
    SELECT m.MemberID, m.FirstName, m.LastName, m.Gender, m.DateOfBirth,
           m.MembershipStart, m.MembershipEnd,
           vs.InitialRecordDate, vs.InitialWeightLbs,
           vs.LatestRecordDate, vs.LatestWeightLbs
    FROM Members m
    LEFT JOIN vwMemberInitialVsLatest vs
    ON m.MemberID = vs.MemberID;
GO

```

Explanation: This view displays the membership data of all the members alongside their initial and latest weight. It will show NULL for members with no existing fitness record.

```

-- View #5: vwTrainerNutritionTraining (Trainer View)
CREATE VIEW vwTrainerNutritionTraining
AS
    SELECT m.MemberID, fr.RecordDate,
           m.FirstName, m.LastName, m.DateOfBirth, m.Gender,
           dbo.GetCalorieMaintenance(fr.RecordDate, m.MemberID) AS CalorieMaintenance,
           fr.CalorieIntake, fr.WeightLbs, fr.HeightInches,
           dbo.GetBMIValue(fr.HeightInches, fr.WeightLbs) AS BMIValue,
           dbo.GetBMIClass(dbo.GetBMIValue(fr.HeightInches, fr.WeightLbs)) AS BMIClass,
           e.EquipmentName, e.EquipmentType, u.UsageStart, u.UsageEnd
    FROM Members m
    JOIN FitnessRecords fr
    ON m.MemberID = fr.MemberID
    JOIN EquipmentUsages u
    ON m.MemberID = u.MemberID AND u.UsageDate = fr.RecordDate
    JOIN Equipments e
    ON u.EquipmentID = e.EquipmentID;
GO

```

Explanation: This view is for the gym trainers, and it displays the membership data of the members alongside their fitness records, equipment used, and usage records. The view also shows the calculated calorie maintenance needed by the member, their BMI value and classification. It will only show those members that have existing fitness record, equipment, and usage record.

```

-- View #6: vwFinanceMembershipPayment (Finance View)
CREATE VIEW vwFinanceMembershipPayment
AS
    SELECT m.MemberID, m.FirstName, m.LastName,
           m.MembershipStart, m.MembershipEnd, m.MembershipType,
           p.PaymentID, p.PaymentDate, p.Amount, p.PaymentMethod
    FROM Members m
    LEFT JOIN Payments p
    ON m.MemberID = p.MemberID;
GO

```

Explanation: This view is for the finance staff, and it displays the membership data of all the members alongside their payment records. It will show NULL for members with no existing payment record.

4.1.2 SQL Code for Stored Procedures with Explanation

All the stored procedures are created with the Database Object II material^[8] used as reference. Coding conventions and best practices such as commenting and adding the prefix “sp” is followed. Also, error handling with the use of Try-Catch is implemented for proper transaction management.

```
-- Stored Procedure #1: spAddMember
CREATE PROCEDURE spAddMember
    @FirstName NVARCHAR(50),
    @LastName NVARCHAR(50),
    @Gender CHAR(1),
    @Email NVARCHAR(50) = NULL,
    @Phone NVARCHAR(20),
    @DateOfBirth DATE,
    @TrainerMbrID INT = NULL
AS
BEGIN
    BEGIN TRY
        -- Check if mandatory fields are provided
        IF (@FirstName IS NULL OR @LastName IS NULL OR @Gender IS NULL
            OR @Phone IS NULL OR @DateOfBirth IS NULL)
            THROW 50001, 'Mandatory fields cannot be null.', 1;
        -- Insert member into Members table
        INSERT INTO Members
            (FirstName, LastName, Gender, Email, Phone, DateOfBirth, TrainerMbrID)
        VALUES
            (@FirstName, @LastName, @Gender, @Email, @Phone, @DateOfBirth, @TrainerMbrID);
        -- Print success message
        DECLARE @tmpMemberID INT;
        SELECT @tmpMemberID = MAX(MemberID) FROM Members;
        PRINT 'Member successfully added. Your Member ID is: ' + CONVERT(varchar, @tmpMemberID);
    END TRY
    BEGIN CATCH
        PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
    END CATCH
END
GO
```

Explanation: This stored procedure is responsible for adding a new member to the database. It will check first if the required attributes are given. If so, it will insert the member data to the members table and it will print a success message along with the new Member ID. Otherwise, it will throw an error message that the mandatory fields cannot be null. Also, if something went wrong during the execution, the stored procedure would catch it and will print error occurred.

```

-- Stored Procedure #2: spAddPaymentUpdateMembership
CREATE PROCEDURE spAddPaymentUpdateMembership
    @MemberID INT,
    @PaymentAmount MONEY,
    @PaymentMethod NVARCHAR(50)
AS
BEGIN
    BEGIN TRY
        -- Check if mandatory fields are provided
        IF (@MemberID IS NULL OR @PaymentAmount IS NULL OR @PaymentMethod IS NULL)
            THROW 50001, 'MemberID and Payment Info cannot be null.', 1;
        -- Check if the member exists
        IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE MemberID = @MemberID
        )
            THROW 50002, 'Member ID does not exist.', 1;

        -- Add payment record
        DECLARE @PaymentDate DATE = GETDATE(); -- Assume payment date is current date
        INSERT INTO Payments
            (PaymentDate, Amount, PaymentMethod, MemberID)
        VALUES
            (@PaymentDate, @PaymentAmount, @PaymentMethod, @MemberID);
        -- Calculate MembershipEnd date
        -- (one day before the end of the month following MembershipStart date)
        DECLARE @MembershipStart DATE = @PaymentDate;
        DECLARE @MembershipEnd DATE = DATEADD(DAY, -1, DATEADD(MONTH, 1, @PaymentDate));
        -- Check if membership is standard or premium
        DECLARE @MembershipType NVARCHAR(10);
        IF @PaymentAmount = 50
            SET @MembershipType = 'Standard'
        IF @PaymentAmount = 100
            SET @MembershipType = 'Premium'
        -- Check if member is new or just renewing
        DECLARE @OldMembershipStart DATE;
        SELECT @OldMembershipStart = MembershipStart
        FROM Members
        WHERE MemberID = @MemberID;
        IF @OldMembershipStart IS NOT NULL
            SET @MembershipStart = @OldMembershipStart;
        -- Update MembershipStart, MembershipEnd, and MembershipType columns in Members table
        UPDATE Members
        SET MembershipStart = @MembershipStart,
            MembershipEnd = @MembershipEnd,
            MembershipType = @MembershipType
        WHERE MemberID = @MemberID;
        -- Print success message
        PRINT 'Payment record added and membership details updated.';
    END TRY
    BEGIN CATCH
        PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
    END CATCH
END
GO

```

Explanation: The above stored procedure is responsible for adding a payment record to the database for the given Member ID. It is also responsible for updating the membership information of that

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member according to which he paid for. It will check first if the mandatory fields are provided and will also check if the provided Member ID exists. If so, it will add the payment record and it will update the Members table. The Membership Start will be the Payment Date, and the Membership End will be after 1 month less 1 day. The Membership Type will be updated to "Standard" if payment is 50, and "Premium" if payment is 100. The stored procedure will throw an error if the mandatory fields are not provided, if the member ID does not exist, and if something went wrong during the execution.

Improvements Done:

Added check if member exists. Initially does not check the existence of Member ID.

Removed redundant checking for incorrect payment.

```
-- Stored Procedure #3: spMemberCheckIn
CREATE PROCEDURE spMemberCheckIn
    @MemberID INT
AS
BEGIN
    BEGIN TRY
        -- Check if mandatory fields are provided
        IF (@MemberID IS NULL)
            THROW 50001, 'MemberID cannot be null.', 1;
        -- Get it to the current date and time
        DECLARE @AttendanceDate DATE;
        DECLARE @CheckInTime TIME;
        SET @AttendanceDate = CONVERT(DATE, GETDATE());
        SET @CheckInTime = CONVERT(TIME, GETDATE());
        -- Check if the member exists
        IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE MemberID = @MemberID
        )
            THROW 50002, 'Member ID does not exist.', 1;
        -- Check if the attendance date falls within the member's active membership period
        ELSE IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE (MemberID = @MemberID) AND
                (@AttendanceDate BETWEEN MembershipStart AND MembershipEnd)
        )
            THROW 50002, 'Attendance date is not within the member''s
                active membership period.', 1;
        -- Insert attendance record into the Attendances table
        INSERT INTO Attendances
            (AttendanceDate, CheckInTime, MemberID)
        VALUES
            (@AttendanceDate, @CheckInTime, @MemberID);
        -- Print success message
        PRINT 'Member successfully checked in.';
    END TRY
    BEGIN CATCH
        PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
    END CATCH
END
GO
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```

Explanation: The stored procedure above is responsible for member attendance check-ins while checking their active membership period. It first checks if the Member ID is provided, and it also checks if that Member ID exists. Afterwards, it checks that member's active membership period is valid. If all checks are passed, the current date and time are inserted into the Attendances table as a check-in record, and a success message will be printed. Otherwise, it will throw an error message.

```
-- Stored Procedure #4: spMemberCheckOut
CREATE PROCEDURE spMemberCheckOut
    @MemberID INT
AS
BEGIN
    BEGIN TRY
        -- Check if mandatory fields are provided
        IF (@MemberID IS NULL)
            THROW 50001, 'MemberID cannot be null.', 1;
        -- Get it to the current date and time
        DECLARE @AttendanceDate DATE;
        DECLARE @CheckOutTime TIME;
        SET @AttendanceDate = CONVERT(DATE, GETDATE());
        SET @CheckOutTime = CONVERT(TIME, GETDATE());
        -- Check if the member exists
        IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE MemberID = @MemberID
        )
            THROW 50002, 'Member ID does not exist.', 1;
        -- Check if the attendance date falls within the member's active membership period
        ELSE IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE (MemberID = @MemberID) AND
                (@AttendanceDate BETWEEN MembershipStart AND MembershipEnd)
        )
            THROW 50002, 'Attendance date is not within the member''s
                active membership period.', 1;
        -- Check if the latest checkin has a NULL checkout
        ELSE IF NOT EXISTS (
            SELECT TOP 1 AttendanceID
            FROM Attendances
            WHERE MemberID = @MemberID AND
                AttendanceDate = @AttendanceDate AND
                CheckOutTime IS NULL
            ORDER BY AttendanceDate, CheckInTime DESC
        )
            THROW 50002, 'Member already clocked out.', 1;
        -- Get the AttendanceID of the latest attendance done by the member
        DECLARE @AttendanceID INT;
        SELECT TOP 1 @AttendanceID = AttendanceID
        FROM Attendances
        WHERE MemberID = @MemberID AND
            AttendanceDate = @AttendanceDate
        ORDER BY AttendanceDate, CheckInTime DESC;
        -- Update attendance record into the Attendances table
        UPDATE Attendances
        SET CheckOutTime = @CheckOutTime
```



```

        WHERE AttendanceID = @AttendanceID;
        -- Print success message
        PRINT 'Member successfully checked out.';
    END TRY
    BEGIN CATCH
        PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
    END CATCH
END
GO

```

Explanation: The above stored procedure is responsible for member attendance check-outs while checking their active membership period. It first checks if the Member ID is provided, and it also checks if that Member ID exists. Afterwards, it checks that member's active membership period is valid. It will then check if the member's latest check-in record has no corresponding check-out record, and it will get the Attendance ID of that record. If all checks are passed, the current time is inserted into that Attendance ID record as a check-out, and a success message will be printed. Otherwise, the stored procedure will throw an error message accordingly.

```

-- Stored Procedure #5: spAddFitnessRecord
CREATE PROCEDURE spAddFitnessRecord
    @MemberID          INT,
    @CalorieIntake      DECIMAL(10,2),
    @WeightLbs          DECIMAL(10,2),
    @HeightInches       DECIMAL(10,2)
AS
BEGIN
    BEGIN TRY
        -- Check if mandatory fields are provided
        IF (@MemberID IS NULL OR @CalorieIntake IS NULL OR
            @WeightLbs IS NULL OR @HeightInches IS NULL)
            THROW 50001, 'Mandatory fields cannot be null.', 1;
        -- Get it to the current date
        DECLARE @RecordDate DATE;
        SET @RecordDate = CONVERT(DATE, GETDATE());
        -- Check if the member exists
        IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE MemberID = @MemberID
        )
            THROW 50002, 'Member ID does not exist.', 1;
        -- Check if the attendance date falls within the member's active membership period
        ELSE IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE (MemberID = @MemberID) AND
                (@RecordDate BETWEEN MembershipStart AND MembershipEnd)
        )
            THROW 50002, 'Record date is not within the member's
                active membership period.', 1;
        -- Insert fitness record data
        INSERT INTO FitnessRecords
            (RecordDate, MemberID, WeightLbs, HeightInches, CalorieIntake)
        VALUES

```

```

        (@RecordDate, @MemberID, @WeightLbs, @HeightInches, @CalorieIntake);
-- Print success message
PRINT 'Fitness record successfully added. BMI is: '
    + CONVERT(varchar, dbo.GetBMIClass(dbo.GetBMIValue(@HeightInches, @WeightLbs)));
PRINT 'Current BMI value is: '
    + CONVERT(varchar, dbo.GetBMIValue(@HeightInches, @WeightLbs));
END TRY
BEGIN CATCH
    PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
END CATCH
END
GO

```

Explanation: The above stored procedure is responsible for adding a fitness record of the members while checking their active membership period. It first checks if the mandatory fields are provided, and it also checks if the given Member ID exists. Afterwards, it checks that member's active membership period is valid. If all checks are passed, the current date is inserted into the Fitness Records table along with the provided weight, height, and calorie intake. Then a success message will be printed with the calculated BMI value and classification. Otherwise, the stored procedure will throw an error message accordingly.

```

-- Stored Procedure #6: spAddEquipmentUsageStart
CREATE PROCEDURE spAddEquipmentUsageStart
    @MemberID INT,
    @EquipmentID INT
AS
BEGIN
    BEGIN TRY
        -- Check if mandatory fields are provided
        IF (@MemberID IS NULL OR @EquipmentID IS NULL)
            THROW 50001, 'Mandatory fields cannot be null.', 1;
        -- Get it to the current date and time
        DECLARE @UsageDate DATE;
        DECLARE @UsageStart TIME;
        SET @UsageDate = CONVERT(DATE, GETDATE());
        SET @UsageStart = CONVERT(TIME, GETDATE());
        -- Check if the member exists
        IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE MemberID = @MemberID
        )
            THROW 50002, 'Member ID does not exist.', 1;
        -- Check if the equipment exists
        ELSE IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Equipments
            WHERE EquipmentID = @EquipmentID
        )
            THROW 50002, 'Equipment ID does not exist.', 1;
        -- Check if the usage date falls within the member's active membership period
        ELSE IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members

```

```

        WHERE      (MemberID = @MemberID) AND
                   (@UsageDate BETWEEN MembershipStart AND MembershipEnd)
    )
    THROW 50002, 'Usage date is not within the member's active membership period.', 1;
-- Insert fitness record data
INSERT INTO EquipmentUsages
    (MemberID, UsageDate, UsageStart, UsageEnd, EquipmentID)
VALUES
    (@MemberID, @UsageDate, @UsageStart, NULL, @EquipmentID);
-- Print success message
PRINT 'Equipment usage start time successfully added.';
END TRY
BEGIN CATCH
    PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
END CATCH
END
GO

```

Explanation: The above stored procedure is responsible for adding an equipment usage start record while checking the member's active membership period. It first checks if the mandatory fields are provided, and it also checks if the given Member ID exists. Afterwards, it checks if the given Equipment ID exists. Furthermore, it also checks if the member's active membership period is valid. If all checks are passed, the current date and time are inserted into the Equipment Usages table as Usage Start along with the provided Equipment ID. Finally, a success message will be printed. Otherwise, the stored procedure will throw an error message accordingly.

```

-- Stored Procedure #7: spAddEquipmentUsageEnd
CREATE PROCEDURE spAddEquipmentUsageEnd
    @MemberID          INT,
    @EquipmentID       INT
AS
BEGIN
    BEGIN TRY
        -- Check if mandatory fields are provided
        IF (@MemberID IS NULL OR @EquipmentID IS NULL)
            THROW 50001, 'Mandatory fields cannot be null.', 1;
        -- Get it to the current date and time
        DECLARE @UsageDate DATE;
        DECLARE @UsageEnd TIME;
        SET @UsageDate = CONVERT(DATE, GETDATE());
        SET @UsageEnd = CONVERT(TIME, GETDATE());
        -- Check if the member exists
        IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE MemberID = @MemberID
        )
            THROW 50002, 'Member ID does not exist.', 1;
        -- Check if the attendance date falls within the member's active membership period
        ELSE IF NOT EXISTS (
            SELECT 1 -- Arbitrary value to check existence
            FROM Members
            WHERE MemberID = @MemberID AND @UsageDate BETWEEN MembershipStart AND MembershipEnd
        )
    END TRY
    BEGIN CATCH
        PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
    END CATCH
END
GO

```

```

        THROW 50002, 'Usage date is not within the member's active membership period.', 1;
-- Check if the equipment exists
ELSE IF NOT EXISTS (
    SELECT 1 -- Arbitrary value to check existence
    FROM Equipments
    WHERE EquipmentID = @EquipmentID
)
    THROW 50002, 'Equipment ID does not exist.', 1;
-- Check if the equipment used by member
ELSE IF NOT EXISTS (
    SELECT 1 -- Arbitrary value to check existence
    FROM EquipmentUsages
    WHERE MemberID = @MemberID AND EquipmentID = @EquipmentID
)
    THROW 50002, 'Equipment ID not in use.', 1;
-- Check if the latest checkin has a NULL checkout
ELSE IF NOT EXISTS (
    SELECT TOP 1 *
    FROM EquipmentUsages
    WHERE MemberID = @MemberID AND
        EquipmentID = @EquipmentID AND
        UsageDate = @UsageDate AND
        UsageEnd IS NULL
    ORDER BY UsageDate, UsageStart DESC
)
    THROW 50002, 'End time already logged.', 1;
-- Update attendance record into the Attendances table
UPDATE EquipmentUsages
SET UsageEnd = @UsageEnd
WHERE MemberID = @MemberID AND
    EquipmentID = @EquipmentID AND
    UsageDate = @UsageDate AND
    UsageEnd IS NULL;
-- Print success message
PRINT 'Equipment usage end time successfully updated.';
END TRY
BEGIN CATCH
    PRINT 'Error occurred: ' + CONVERT(varchar, ERROR_MESSAGE());
END CATCH
END
GO

```

Explanation: This stored procedure is responsible for adding an equipment usage end record while checking the member's active membership period. It first checks if the mandatory fields are provided, and it also checks if the given Member ID exists. It then checks if the member's active membership period is valid. Afterwards, it checks if the given Equipment ID exists, and if that equipment is currently recorded to the member. Furthermore, it checks if the latest usage start record has no corresponding usage end record. If all checks are passed, the current time is inserted into the Equipment Usages table as Usage End. Finally, a success message will be printed. Otherwise, the stored procedure will throw an error message accordingly.

4.1.3 SQL Code for Functions with Explanation

All the functions in this project are created with the Database Object II material^[8] used as reference.

```
-- Function #1: GetCalorieMaintenance
CREATE FUNCTION GetCalorieMaintenance(
    @RecordDate DATE,
    @MemberID INT)
RETURNS DECIMAL(10,2)
AS
BEGIN
    -- Get Gender and DOB (Age)
    DECLARE @Gender CHAR(1);
    DECLARE @Age INT;
    DECLARE @DOB DATE;
    SELECT @Gender = Gender,
           @DOB = DateOfBirth
    FROM Members
    WHERE MemberID = @MemberID;
    SET @Age = DATEDIFF(YEAR, @DOB, @RecordDate);
    -- Get WeightLbs and HeightInches
    DECLARE @WeightLbs DECIMAL(10,2);
    DECLARE @HeightInches DECIMAL(10,2);
    SELECT @WeightLbs = WeightLbs,
           @HeightInches = HeightInches
    FROM FitnessRecords
    WHERE RecordDate = @RecordDate AND MemberID = @MemberID;
    -- Calculate Basal Metabolic Rate (BMR) based on gender
    DECLARE @WeightKg DECIMAL(10,2);
    DECLARE @HeightCm DECIMAL(10,2);
    SET @WeightKg = @WeightLbs / 2.204623
    SET @HeightCm = @HeightInches * 2.54

    DECLARE @BMR DECIMAL(10,2);
    DECLARE @CalorieMaintenance DECIMAL(10,2);
    IF @Gender = 'M'
        SET @BMR = (10 * @WeightKg) + (6.25 * @HeightCm) - (5 * @Age) + 5;
    ELSE
        SET @BMR = (10 * @WeightKg) + (6.25 * @HeightCm) - (5 * @Age) - 161;
    -- Calculate TDEE (Calorie Maintenance) based on BMR and activity level
    -- Total Daily Energy Expenditure is how much energy you burn each day
    -- which is basically equivalent to the calories your body needs to maintain weight
    SET @CalorieMaintenance = @BMR * 1.55 -- Moderately active
    RETURN @CalorieMaintenance;
END;
GO
```

Explanation: This function is responsible for calculating the calorie maintenance of a member given a particular record date. It gets the member's gender, weight, and height. Then it calculates the age given the record date, and it also calculates the Basal Metabolic Rate (BMR) based on the gender. Afterwards, the BMR is multiplied to a factor for moderately active individuals, and it returns the result as calorie maintenance, which is also known as the Total Daily Energy Expenditure (TDEE).^[2]

```

-- Function #2: GetBMIValue
CREATE FUNCTION GetBMIValue(@HeightInches DECIMAL(10,2), @WeightLbs DECIMAL(10,2))
RETURNS DECIMAL(10,2)
AS
BEGIN
    DECLARE @BMI DECIMAL(10,2);
    SET @BMI = (@WeightLbs / POWER(@HeightInches, 2)) * 703;
    RETURN @BMI;
END;
GO

```

Explanation: This function is responsible for calculating the BMI value given the height in inches and weight in pounds. It uses the BMI formula for imperial units^[3] and returns the calculated value.

```

-- Function #3: GetBMIClass
CREATE FUNCTION GetBMIClass(@BMI DECIMAL(10,2))
RETURNS NVARCHAR(20)
AS
BEGIN
    DECLARE @BMICategory NVARCHAR(50) = NULL;
    -- Determine BMI category
    IF @BMI < 18.5
        SET @BMICategory = 'Underweight';
    ELSE IF @BMI >= 18.5 AND @BMI < 25
        SET @BMICategory = 'Normal';
    ELSE IF @BMI >= 25 AND @BMI < 30
        SET @BMICategory = 'Overweight';
    ELSE IF @BMI >= 30
        SET @BMICategory = 'Obese';

    RETURN @BMICategory;
END;
GO

```

Explanation: This function is responsible for classifying the given BMI value to the weight categories. It uses the standard BMI Chart^[3], and the Obesity classes are merged into just one category for this function, and finally the corresponding BMI category is returned.

4.2 Implementation of Triggers

4.2.1 SQL Code for Triggers

```
-- Trigger #1: tgDeleteAttendanceOutsideGymHours
CREATE TRIGGER tgDeleteAttendanceOutsideGymHours
    ON Attendances
    AFTER INSERT
AS
BEGIN
    -- Define the fixed open and close times for the gym
    DECLARE @GymOpenTime    TIME = '04:30:00';
    DECLARE @GymCloseTime   TIME = '23:30:00';
    -- Define the last check-in as 1 hour before the gym's closing time
    DECLARE @GymLastCheckIn TIME = DATEADD(HOUR, -1, @GymCloseTime);
    -- Check if the inserted attendance record falls OUTSIDE of gym hours
    IF EXISTS (
        SELECT 1 -- Arbitrary value to check existence
        FROM Inserted AS i
        WHERE i.CheckInTime < @GymOpenTime OR i.CheckInTime > @GymLastCheckIn
    )
    BEGIN
        THROW 50113, 'TG1: Check-in is outside gym hours.', 1;
        ROLLBACK TRAN;
    END
END
GO
```

```
-- Trigger #2: tgPreventCheckinsWithoutCheckout
CREATE TRIGGER tgPreventCheckinsWithoutCheckout
    ON Attendances
    INSTEAD OF INSERT
AS
BEGIN
    -- Check if any inserted records violate the rule
    IF EXISTS (
        SELECT 1 -- Arbitrary value to check existence
        FROM Inserted AS i
        JOIN Attendances AS a
            ON i.MemberID = a.MemberID
        WHERE (i.AttendanceDate = a.AttendanceDate
            AND i.CheckInTime IS NOT NULL
            AND a.CheckOutTime IS NULL) -- Member hasn't clocked out yet
    )
        THROW 50114, 'TG2: Please check-out first.', 1;
    ELSE
    BEGIN
        -- Perform the actual insert operation
        INSERT INTO Attendances
            (AttendanceDate, CheckInTime, MemberID)
            (SELECT i.AttendanceDate, i.CheckInTime, i.MemberID
                FROM Inserted AS i);
    END
END
GO
```

```

-- Trigger #3: tgPreventIncorrectPayment
CREATE TRIGGER tgPreventIncorrectPayment
    ON Payments
    INSTEAD OF INSERT
AS
BEGIN
    -- Check existence of TrainerID in Member Record
    DECLARE @InsertedMbrID INT;
    DECLARE @Amount MONEY;
    DECLARE @TrainerMbrID INT;

    SELECT      @InsertedMbrID = MemberID,
                @Amount = Amount
    FROM Inserted;

    SELECT @TrainerMbrID = TrainerMbrID
    FROM Members
    WHERE MemberID = @InsertedMbrID;

    -- Check if any inserted records violate the rule
    IF @Amount NOT IN (50, 100)
        THROW 50114, 'TG3: Must be $50 or $100.', 1;
    ELSE IF (@TrainerMbrID IS NULL AND @Amount <> 50)
        THROW 50114, 'TG3: Amount should be 50.', 1;
    ELSE IF (@TrainerMbrID IS NOT NULL AND @Amount <> 100)
        THROW 50114, 'TG3: Amount should be 100.', 1;
    ELSE
    BEGIN
        -- Perform the actual insert operation
        INSERT INTO Payments
            (PaymentDate, Amount, PaymentMethod, MemberID)
            (SELECT i.PaymentDate, i.Amount, i.PaymentMethod, i.MemberID
             FROM Inserted AS i);
    END
END
GO

```

4.2.2 Explanation of Triggers Functionality

All the triggers in this project are created with the Database Object II material^[8] used as reference. Coding conventions and best practices such as commenting and adding the prefix “tg” is followed.

Trigger #1: tgDeleteAttendanceOutsideGymHours

The functionality of this trigger is to ensure that the records inserted outside of the allowed gym check-in hours are deleted from the Attendances table. A check-in should only be done within the allowed window hours. The Gym Open Time is set to 4:30AM and the Gym Close Time is set to 11:30PM. The window hours of allowable check-ins are from the Gym Open Time until to 1 hour before the Gym Close Time. This trigger will fire after the insert statement to check the validity of the check-in. If invalid, an error message will be thrown, and the insert transaction will be rolled back.

Trigger #2: tgPreventCheckinsWithoutCheckout

The functionality of this trigger is to ensure that the members cannot check-in multiple times without checking-out first from the Attendances table. Instead of the insert statement, the trigger will check first if the records to be inserted violate the rule that the member has not checked-out yet. If the rule is violated, the trigger will throw an error message. Otherwise, the insert statement is performed.

Trigger #3: tgPreventIncorrectPayment

This functionality of this trigger is to ensure that incorrect payment information cannot be inserted to the Payments table. To be considered correct payment, the rules are as follows. First, the payment amount should only be 50 or 100. Second, if the member has no trainer, the amount to be paid should be 50. Finally, if the member has a trainer, the amount to be paid should be 100. Instead of the insert statement, the trigger will check first if the records to be inserted violate any of the rules. If violated, the trigger will throw an error message accordingly. Otherwise, the insert statement is performed.

Improvements Done:

Added checks to ensure payment must be 50 or 100 only. Initially accepts any amount.

Updated message that displays clearly which payment is needed.

5. Final Demonstration and Compilation

5.1 PowerPoint Presentation

Attached as a separate PPT file.

5.2 Final Demo

5.2.1 How to Execute the Code

YouTube Video Link: <https://youtu.be/3IRqlq9LADY?si=tLz0Ix4UO6ATZYBX>

5.2.2 Front-End GUI

Python is used for the Front-End GUI of this project. This section shows the screenshots of the GUI. The python code used is provided in [Appendix B](#).

1. Main Window

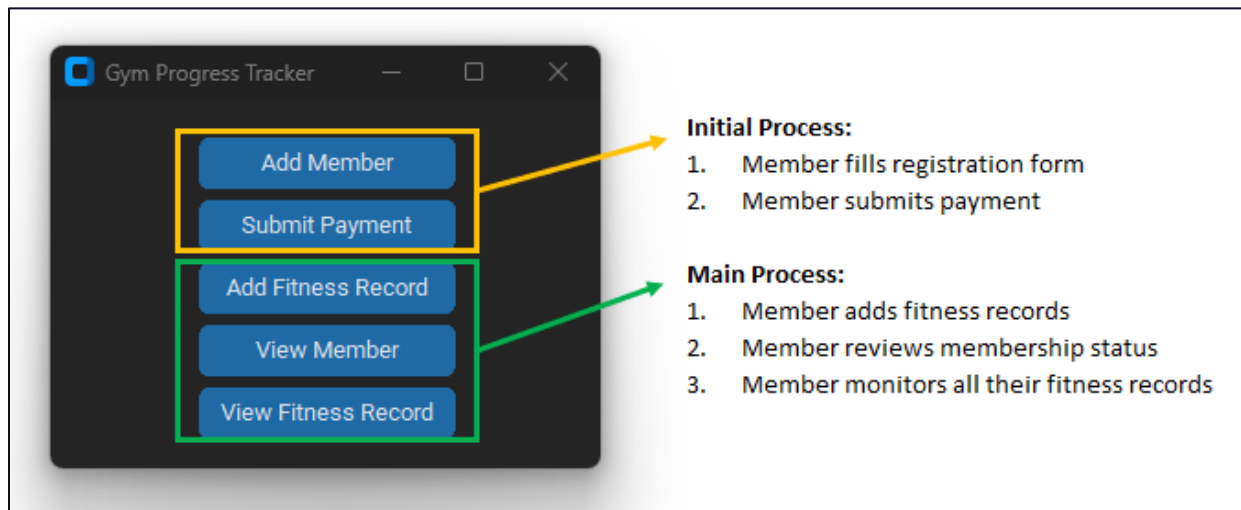


Figure 4. Main Window and Description of the GUI.

This is the main window that the user can interact with upon running the Front-End of this project.

2. Add Member Window

The image shows two overlapping windows from a GUI. The window in the foreground is titled 'Insert Member Data' and contains the following fields and values:

- First Name: Jeddy
- Last Name: Lorait
- Date of Birth: 2002-06-05
- Gender: Male (dropdown menu)
- Email: jloraitf@abc.net.ca
- Phone Number: 3486427849

There is an 'Add Member' button at the bottom right of this window. The window in the background is titled 'Insert Member D...' and displays a calendar for June 2002. The calendar has a grid with days of the week (Mon to Sun) and dates (1 to 30). A 'Set Date of Birth' button is located at the bottom right of this window.

Figure 5. Add Member Window of the GUI.

This window basically accepts member details and stores to the GymProgressTracker database.

Improvements Done:

Added date picker for Date of Birth field.

Changed from input field to dropdown for Gender field.

3. Submit Payment Window

The image shows a single window titled 'Add Payment an...'. It contains the following fields and values:

- Member ID: 12
- Membership Type: Premium (dropdown menu)
- Payment Method: Credit Card (dropdown menu)
- Payment Amount: 100

There is a 'Submit Payment' button at the bottom right of the window.

Figure 6. Submit Payment Window of the GUI.

This window allows input of the payment details. Upon submission, it adds the payment record and updates the membership information of the provided Member ID.

Improvements Done:

Changed from input field to dropdown for Membership Type field.

Added dropdown option for Payment Method field.

Changed from manual to autofill based on Membership Type for Payment Amount field.

4. Add Fitness Record Window

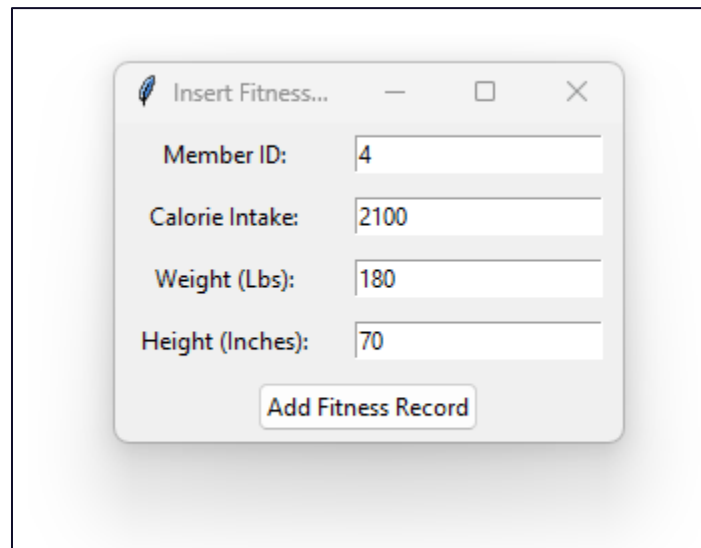


Figure 7. Add Fitness Record Window of the GUI.

This window accepts the input fitness information and stores the record for the provided Member ID.

Improvements Done:

Minor GUI changes that add padding between fields.

5. View Member Window

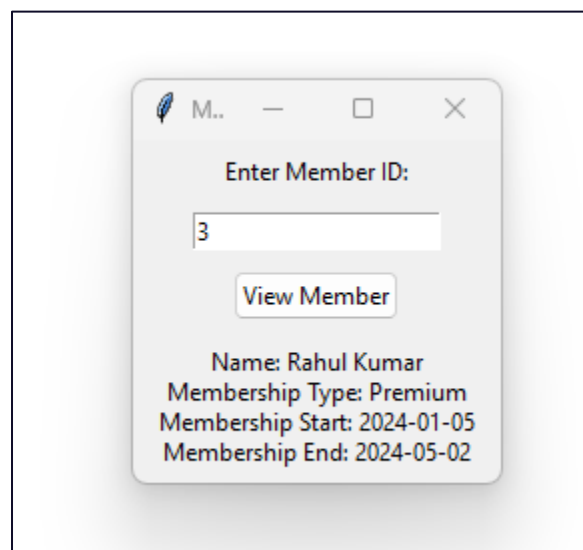


Figure 8. View Member Window of the GUI.

This window basically shows the membership type, start, and end date of the provided Member ID.

6. View Fitness Record Window

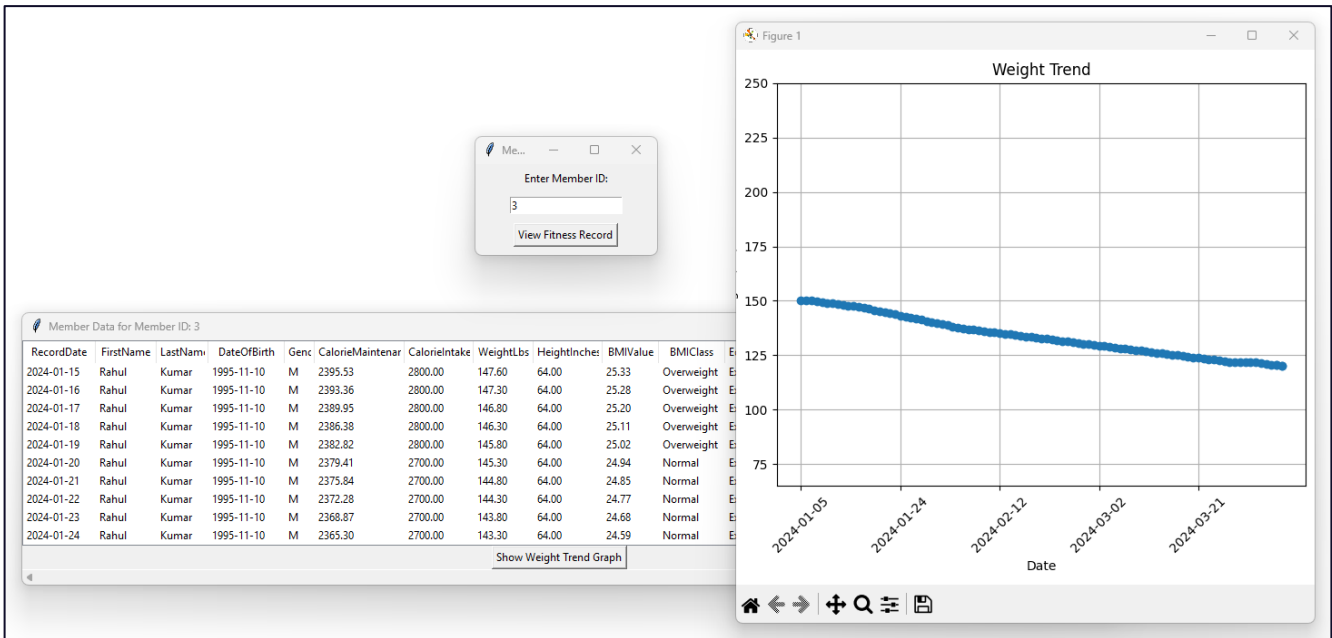


Figure 9. View Fitness Record Window and Weight Trend Sub-window of the GUI.

This fitness record window shows detailed information of the provided Member ID which includes the calculated calorie maintenance, BMI value, and BMI classification for each record date. It also shows the weight trend of the member based on all the historical data from the database.

6. Conclusion

- Summary of Achievements

This project enabled the successful creation of a relational database system for gym fitness centers. The authors achieved to analyze the business requirements and translate those rules into a working relational database system. Firstly, the business rules are transformed to a conceptual model using an entity-relationship diagram (ERD). This model is then converted into a relational schema, and then to a database structure using SQL Data Definition Language (DDL) statements. Database objects which include 6 tables, 3 functions, 6 views, 7 stored procedures, and 3 triggers are also created. Furthermore, SQL Data Manipulation Language (DML) statements are used to insert and modify data from the database. Four (4) users are also created: Admin, Member, Trainer, and Finance Staff. The admin user has full privileges while the rest has limited privileges. Finally, the authors achieved to display the database records using a front-end GUI with the use of python.

- Reflection on the Learning Outcomes

The authors have experienced significant understanding of using SQL on relational databases. Being the standard language in managing databases, the authors comprehend that SQL enables the efficient retrieval and manipulation of data.

The authors also understood the importance of really understanding the requirements which is crucial to creating a conceptual model of the database in the database design process. It is important to have a clear communication between the businesspeople, designers, and developers to create a strong ERD. In addition, the authors have gained skills in database programming using the SQL DDL and DML statements, as well as executing single-table and multiple-table queries. Furthermore, the authors reflected that the database design process is expected to be an iterative process, and that design modifications are equally important.

In conclusion, the learning outcomes of this course provided the authors a huge opportunity to understand the theories and develop practical skills in database design, implementation and management which meets the business needs. The authors have increased their proficiency in Database Design and SQL, as well as the skill in technical documentation of a database project.

- Future Work Recommendations

1. This database project can include separate triggers for each table that checks the member's active membership period. Currently, this check is done inside the stored procedures instead of a trigger.
2. This database project can include more fitness record attributes to provide more insights.
3. The front-end GUI can include a user login.
4. The front-end GUI forms can display if a field is required or not.
5. The front-end GUI can add a functionality that enables adding a trainer in a dropdown.
6. The front-end GUI can add a functionality for check-in and check-out for attendance and equipment usage.

Appendices

A. Insert Statements

** The insert statements below are from the Microsoft SQL Server Generate Scripts functionality.*

The statements cover all the data from the database as of date of generation, 19th April 2024.

** The original insert statements that were initially used are also included in the last part of Appendix A.*

```
-- For Members Table
SET IDENTITY_INSERT [dbo].[Members] ON
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (1, N'John', N'Doe', N'M',
N'john.doe@example.com', N'1234567890', CAST(N'1990-05-15' AS Date), CAST(N'2023-08-04' AS Date),
CAST(N'2024-05-09' AS Date), N'Standard', NULL)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (2, N'Jane', N'Smith',
N'F', N'jane.smith@example.com', N'9876543210', CAST(N'1985-08-20' AS Date), CAST(N'2024-03-29' AS
Date), CAST(N'2024-05-11' AS Date), N'Standard', NULL)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (3, N'Rahul', N'Kumar',
N'M', N'rahul.kumar@example.com', N'5551234567', CAST(N'1995-11-10' AS Date), CAST(N'2024-01-05' AS
Date), CAST(N'2024-05-02' AS Date), N'Premium', 1)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (4, N'Emily', N'Davis',
N'F', N'emily.davis@example.com', N'4449876543', CAST(N'1988-04-25' AS Date), CAST(N'2024-04-04' AS
Date), CAST(N'2024-05-03' AS Date), N'Premium', 2)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (5, N'Juan', N'Dela Cruz',
N'M', N'juan.delacruz@example.com', N'6667890123', CAST(N'1992-09-30' AS Date), CAST(N'2024-04-05' AS
Date), CAST(N'2024-05-05' AS Date), N'Premium', 1)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (6, N'Yuma', N'Lawrence',
N'M', N'ylawrence0@miibeian.gov.cn', N'1587588503', CAST(N'1998-08-17' AS Date), CAST(N'2024-04-09' AS
Date), CAST(N'2024-05-08' AS Date), N'Premium', 1)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (10, N'Demetra',
N'Commander', N'F', N'dcommander1@answers.com', N'2383570976', CAST(N'1999-02-14' AS Date), CAST(N'2024-
04-09' AS Date), CAST(N'2024-05-08' AS Date), N'Premium', 1)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (12, N'Kelly', N'Panner',
N'M', N'kpanner2@dell.com', N'9164311758', CAST(N'2004-09-30' AS Date), CAST(N'2024-04-10' AS Date),
CAST(N'2024-05-09' AS Date), N'Premium', 1)
INSERT [dbo].[Members] ([MemberID], [FirstName], [LastName], [Gender], [Email], [Phone], [DateOfBirth],
[MembershipStart], [MembershipEnd], [MembershipType], [TrainerMbrID]) VALUES (13, N'Filmer', N'Cromly',
N'M', N'fcromly3@symantec.com', N'2168969541', CAST(N'1995-08-24' AS Date), CAST(N'2024-04-12' AS Date),
CAST(N'2024-05-11' AS Date), N'Premium', 2)
SET IDENTITY_INSERT [dbo].[Members] OFF
GO

-- For Payments Table
SET IDENTITY_INSERT [dbo].[Payments] ON
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (1,
CAST(N'2023-08-04' AS Date), 100.0000, N'Credit Card', 1)
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (3,
CAST(N'2024-01-05' AS Date), 50.0000, N'Debit Card', 3)
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (12,
CAST(N'2024-04-03' AS Date), 100.0000, N'Credit Card', 2)
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (13,
CAST(N'2024-04-04' AS Date), 50.0000, N'Cash', 4)
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (14,
CAST(N'2024-04-05' AS Date), 50.0000, N'Debit Card', 5)
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (15,
CAST(N'2024-04-07' AS Date), 50.0000, N'Credit Card', 6)
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (16,
CAST(N'2024-04-09' AS Date), 100.0000, N'Cash', 10)
INSERT [dbo].[Payments] ([PaymentID], [PaymentDate], [Amount], [PaymentMethod], [MemberID]) VALUES (17,
CAST(N'2024-04-10' AS Date), 100.0000, N'Cash', 12)
```

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```

INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-04' AS Date), 3, CAST(2300.00 AS Decimal(10, 2)), CAST(120.80 AS Decimal(10, 2)),
CAST(64.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-05' AS Date), 3, CAST(2300.00 AS Decimal(10, 2)), CAST(120.50 AS Decimal(10, 2)),
CAST(64.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-05' AS Date), 4, CAST(4000.00 AS Decimal(10, 2)), CAST(150.30 AS Decimal(10, 2)),
CAST(68.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-05' AS Date), 5, CAST(1800.00 AS Decimal(10, 2)), CAST(120.20 AS Decimal(10, 2)),
CAST(65.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-06' AS Date), 1, CAST(2600.00 AS Decimal(10, 2)), CAST(151.50 AS Decimal(10, 2)),
CAST(70.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-06' AS Date), 2, CAST(3000.00 AS Decimal(10, 2)), CAST(169.50 AS Decimal(10, 2)),
CAST(70.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-06' AS Date), 3, CAST(1500.00 AS Decimal(10, 2)), CAST(120.20 AS Decimal(10, 2)),
CAST(64.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-06' AS Date), 4, CAST(3000.00 AS Decimal(10, 2)), CAST(150.30 AS Decimal(10, 2)),
CAST(68.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-06' AS Date), 5, CAST(1800.00 AS Decimal(10, 2)), CAST(120.20 AS Decimal(10, 2)),
CAST(65.00 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-10' AS Date), 12, CAST(2500.00 AS Decimal(10, 2)), CAST(160.50 AS Decimal(10,
2)), CAST(60.50 AS Decimal(10, 2)))
INSERT [dbo].[FitnessRecords] ([RecordDate], [MemberID], [CalorieIntake], [WeightLbs], [HeightInches])
VALUES (CAST(N'2024-04-12' AS Date), 13, CAST(2500.00 AS Decimal(10, 2)), CAST(150.00 AS Decimal(10,
2)), CAST(68.00 AS Decimal(10, 2)))
GO

```

Original Insert Statements

-- Insert value to Members table

```

INSERT INTO Members (FirstName, LastName, Gender, Email, Phone, DateOfBirth,
MembershipStart, MembershipEnd, MembershipType, TrainerMbrID)
VALUES
('John', 'Doe', 'M', 'john.doe@example.com', '1234567890', '1990-05-15', '2024-03-
02', '2024-04-01', 'Premium', NULL),
('Jane', 'Smith', 'F', 'jane.smith@example.com', '9876543210', '1985-08-20', '2024-
04-03', '2024-05-02', 'Premium', NULL),
('Rahul', 'Kumar', 'M', 'rahul.kumar@example.com', '5551234567', '1995-11-10',
'2024-04-03', '2024-05-02', 'Standard', 1),
('Emily', 'Davis', 'F', 'emily.davis@example.com', '4449876543', '1988-04-25',
'2024-04-04', '2024-05-03', 'Standard', 2),
('Juan', 'Dela Cruz', 'M', 'juan.delacruz@example.com', '6667890123', '1992-09-30',
'2024-04-06', '2024-05-05', 'Standard', 1);
GO

```

-- Insert value to Payments table

```

INSERT INTO Payments (PaymentDate, Amount, PaymentMethod, MemberID)
VALUES
('2024-04-03', 100.00, 'Credit Card', 2),
('2024-04-04', 50.00, 'Cash', 4),
('2024-04-05', 50.00, 'Debit Card', 5),
('2024-04-07', 50.00, 'Credit Card', 6),
('2024-04-09', 100.00, 'Cash', 10),
('2024-04-10', 100.00, 'Cash', 12),
('2024-04-10', 50.00, 'Cash', 1);
GO

```

-- Insert value to Attendances table

```

INSERT INTO Attendances (AttendanceDate, CheckInTime, CheckOutTime, MemberID)
VALUES

```

```

        ('2024-04-06', '07:30:00', NULL, 1),
        ('2024-04-06', '08:15:00', '09:30:00', 2),
        ('2024-04-06', '08:30:00', NULL, 3),
        ('2024-04-06', '08:45:00', NULL, 4),
        ('2024-04-06', '09:00:00', NULL, 5);
GO
-- Insert value to Equipments table
INSERT INTO Equipments (EquipmentName, EquipmentType)
VALUES
    ('Dumbbells', 'Strength'),
    ('Barbell', 'Strength'),
    ('Treadmill', 'Cardio'),
    ('Exercise Bike', 'Cardio'),
    ('Elliptical Machine', 'Cardio')
GO
-- Insert value to EquipmentUsages table
INSERT INTO EquipmentUsages (MemberID, UsageDate, UsageStart, UsageEnd, EquipmentID)
VALUES
    (1, '2024-04-05', '08:00:00', '08:30:00', 1),
    (2, '2024-04-05', '08:30:00', '09:15:00', 2),
    (3, '2024-04-05', '09:00:00', '09:30:00', 3),
    (4, '2024-04-05', '09:15:00', '09:45:00', 4),
    (5, '2024-04-05', '09:30:00', '10:15:00', 5),
    (1, '2024-04-06', '08:00:00', '08:30:00', 1),
    (2, '2024-04-06', '08:30:00', '09:15:00', 2),
    (3, '2024-04-06', '09:00:00', '09:30:00', 3),
    (4, '2024-04-06', '09:15:00', '09:45:00', 4),
    (5, '2024-04-06', '09:30:00', '10:15:00', 5);
GO
-- Insert value to FitnessRecords table
INSERT INTO FitnessRecords (RecordDate, MemberID, CalorieIntake, WeightLbs,
HeightInches)
VALUES
    ('2024-04-05', 1, 1500, 170.5, 70),
    ('2024-04-05', 2, 3000, 170.5, 70),
    ('2024-04-05', 3, 3000, 150.3, 68),
    ('2024-04-05', 4, 4000, 150.3, 68),
    ('2024-04-05', 5, 1800, 120.2, 65),
    ('2024-04-06', 1, 1500, 168.5, 70),
    ('2024-04-06', 2, 3000, 169.5, 70),
    ('2024-04-06', 3, 1500, 120.2, 68),
    ('2024-04-06', 4, 3000, 150.3, 68),
    ('2024-04-06', 5, 1800, 120.2, 65);
GO

```

B. Front-End GUI Code

```
import pyodbc
import tkinter as tk
import tkinter.ttk as ttk
import matplotlib.pyplot as plt
import customtkinter
import datetime
from tkinter import messagebox
from tkinter import Button
from tkcalendar import Calendar

# SQL Server Path
sql_server = "Server=ZHODA_LII\\SQLEXPRESS;"
# Initialize calendar
cal = None

# Add Member Button: Main GUI
def open_insert_members():
    root = tk.Tk()
    root.title("Insert Member Data")
    root.geometry("295x220")

    # Function to insert member data into the database
    def insertMember():
        cursor = None
        try:
            # Connect to the database
            connection = pyodbc.connect(
                "Driver={SQL Server};"
                + sql_server
                + "Database=GymProgressTracker;"
                + "Trusted_Connection=True"
            )

            # Get values from GUI fields
            firstname = entry_firstname.get()
            lastname = entry_lastname.get()
            dob = entry_dof.get()
            gender = entry_gender.get()
            email = entry_email.get()
            phonenumber = entry_phonenumber.get()
            print(gender)

            # Call the stored procedure with the values
            cursor = connection.cursor()
            cursor.execute(
                "EXEC spAddMember ?, ?, ?, ?, ?, ?",
                firstname,
                lastname,
                gender,
                email,
                phonenumber,
                dob,
            )

            # Commit the transaction
            connection.commit()

            # Print member ID
            cursor.execute(f"select MAX(MemberID) FROM Members")

            # Access the data with for loop
            for data in cursor:
                pass

            messagebox.showinfo(
                "Member Information",
                f"MemberID: {data[0]}\nName: {firstname} {lastname}\nDate Of Birth: {dob}",
            )

        except Exception as e:
```

```

        messagebox.showerror("Error", f"Error occurred: {e}")

    finally:
        # Close the cursor and connection
        if cursor:
            cursor.close()
        if cursor:
            connection.close()
        # Close add member window
        root.destroy()

# Function for date picker
def get_date():
    date = cal.get_date()
    entry_dof.delete(0, tk.END)
    # print(date) # 2023-12-02
    entry_dof.insert(0, date)
    top.destroy()

# Function to show date picker calendar
def show_calendar():
    global top
    top = tk.Toplevel(root)

    # Set min and max date
    current_date = datetime.datetime.now()
    default_date = current_date - datetime.timedelta(
        days=3650
    ) # 10 years before now
    min_date = current_date - datetime.timedelta(days=36525) # 100 years before now
    max_date = current_date

    global cal
    cal = Calendar(
        top,
        selectmode="day",
        date_pattern="yyyy-mm-dd",
        mindate=min_date,
        maxdate=max_date,
        year=default_date.year,
        month=current_date.month,
        day=current_date.day,
    )
    cal.pack(padx=10, pady=10)

    button_confirm = ttk.Button(top, text="Set Date of Birth", command=get_date)
    button_confirm.pack(pady=5)

# GUI setup
label_firstname = tk.Label(root, text="First Name:")
entry_firstname = tk.Entry(root)

label_lastname = tk.Label(root, text="Last Name:")
entry_lastname = tk.Entry(root)

label_dof = tk.Label(root, text="Date of Birth:")
entry_dof = tk.Entry(root)
# For date picker
button_calendar = ttk.Button(root, text="▼", command=show_calendar, width=3)

label_gender = tk.Label(root, text="Gender:")
gender_var = tk.StringVar()
entry_gender = ttk.Combobox(
    root, textvariable=gender_var, state="readonly", width=17
)
entry_gender["values"] = ("Male", "Female")
entry_gender.current(0)

label_email = tk.Label(root, text="Email:")
entry_email = tk.Entry(root)

label_phonenumber = tk.Label(root, text="Phone Number:")
entry_phonenumber = tk.Entry(root)

```

```

button_insert = ttk.Button(root, text="Add Member", command=insertMember)

# Positioning
label_firstname.grid(row=0, column=0, padx=10, pady=5)
entry_firstname.grid(row=0, column=1, padx=10, pady=5)

label_lastname.grid(row=1, column=0, padx=10, pady=5)
entry_lastname.grid(row=1, column=1, padx=10, pady=5)

label_dof.grid(row=2, column=0)
entry_dof.grid(row=2, column=1)
button_calendar.grid(row=2, column=2)

label_gender.grid(row=3, column=0, padx=10, pady=5)
entry_gender.grid(row=3, column=1, padx=10, pady=5)

label_email.grid(row=5, column=0, padx=10, pady=5)
entry_email.grid(row=5, column=1, padx=10, pady=5)

label_phonenumber.grid(row=6, column=0, padx=10, pady=5)
entry_phonenumber.grid(row=6, column=1, padx=10, pady=5)

button_insert.grid(row=7, column=1, padx=10, pady=5)

root.mainloop()

# Submit Payment Button: Main GUI
def open_payment_submission():
    # Function to check if member exist
    def is_member_exist():
        try:
            connection = pyodbc.connect(
                "Driver={SQL Server};"
                + sql_server
                + "Database=GymProgressTracker;"
                + "Trusted_Connection=True"
            )
            cursor = connection.cursor()

            cursor.execute(
                f"select * from Members where Memberid = {entry_member_id.get()}"
            )

            # Access the data with a for loop
            data_found = False
            for _ in cursor:
                data_found = True

            return data_found

        except Exception as e:
            messagebox.showerror("Error", f"Error occurred: {e}")

    finally:
        if cursor:
            cursor.close()
        if connection:
            connection.close()

# Function to submit payment data and update membership SQL
def submit_payment():
    member_id = entry_member_id.get()
    if is_member_exist() == True and member_id != "":
        try:
            amount = entry_amount.get()
            payment_method = entry_payment_method.get()

            # Connect to the database
            connection = pyodbc.connect(
                "Driver={SQL Server};"
                + sql_server
                + "Database=GymProgressTracker;"
                + "Trusted_Connection=True"
            )

```

```

    )

    cursor = connection.cursor()

    # Assuming the stored procedure parameters are in the correct order
    cursor.execute(
        "EXEC spAddPaymentUpdateMembership ?, ?, ?",
        member_id,
        amount,
        payment_method,
    )

    connection.commit()

    print("Success", "Payment added and membership updated successfully!")
    messagebox.showinfo(
        "Success", "Payment added and membership updated successfully!"
    )

except Exception as e:
    messagebox.showerror("Error", f"Error occurred: {e}")

finally:
    if cursor:
        cursor.close()
    if connection:
        connection.close()
    # Close window
    root.destroy()
else:
    messagebox.showerror("No Data", "Member ID does not exist.")

# Function for auto update of payment amount field
def update_payment_amount(event):
    selected_mentype = entry_type.get()
    if selected_mentype == "Standard":
        entry_amount.configure(state="normal")
        entry_amount.delete(0, tk.END)
        entry_amount.insert(0, 50)
        entry_amount.configure(state="readonly")
    elif selected_mentype == "Premium":
        entry_amount.configure(state="normal")
        entry_amount.delete(0, tk.END)
        entry_amount.insert(0, 100)
        entry_amount.configure(state="readonly")

root = tk.Tk()
root.title("Add Payment and Update Membership")

label_member_id = tk.Label(root, text="Member ID:")
label_member_id.grid(row=0, column=0, padx=10, pady=5)
entry_member_id = tk.Entry(root)
entry_member_id.grid(row=0, column=1, padx=10, pady=5)

label_type = tk.Label(root, text="Membership Type:")
label_type.grid(row=1, column=0, padx=10, pady=5)
mentype_var = tk.StringVar()
entry_type = ttk.Combobox(
    root, textvariable=mentype_var, state="readonly", width=17
)
entry_type["values"] = ("Standard", "Premium")
entry_type.current(0)
entry_type.grid(row=1, column=1, padx=10, pady=5)
entry_type.bind("<<ComboboxSelected>>", update_payment_amount)

label_payment_method = tk.Label(root, text="Payment Method:")
method_var = tk.StringVar()
entry_payment_method = ttk.Combobox(
    root, textvariable=method_var, state="readonly", width=17
)
entry_payment_method["values"] = ("Cash", "Debit Card", "Credit Card")
entry_payment_method.current(0)
entry_payment_method.grid(row=2, column=1, padx=10, pady=5)
label_payment_method.grid(row=2, column=0, padx=10, pady=5)

```

```

label_amount = tk.Label(root, text="Payment Amount:")
entry_amount = tk.Entry(root)
entry_amount.insert(0, 50)
entry_amount.configure(state="readonly")
label_amount.grid(row=3, column=0, padx=10, pady=5)
entry_amount.grid(row=3, column=1, padx=10, pady=5)

button_submit = ttk.Button(root, text="Submit Payment", command=submit_payment)
button_submit.grid(row=4, columnspan=2, padx=10, pady=5)

root.mainloop()

# Add Fitness Record Button: Main GUI
def open_insert_record():
    # Function to insert fitness record data into the database SQL
    def insertData():
        cursor = None
        try:
            # Connect to the database
            connection = pyodbc.connect(
                "Driver={SQL Server};"
                + "sql_server"
                + "Database=GymProgressTracker;"
                + "Trusted_Connection=True"
            )

            # Get values from GUI fields
            memberid = entry_memberid.get()
            calorieintake = entry_calorieintake.get()
            weight_lbs = entry_weight_lbs.get()
            height = entry_height.get()

            # Convert necessary values to appropriate types
            memberid = int(memberid) # Assuming memberid is an integer
            calorieintake = float(calorieintake) # Assuming calorieintake is an integer
            weight_lbs = float(weight_lbs) # Assuming weight_lbs is a float
            height = float(height) # Assuming height is a float

            # Check if the member ID exists
            cursor = connection.cursor()
            cursor.execute("SELECT MemberID FROM Members WHERE MemberID = ?", memberid)
            if not cursor.fetchone():
                messagebox.showerror("Error", f"Member ID {memberid} does not exist.")
                return

            # Call the stored procedure with the values
            cursor.execute(
                "EXEC spAddFitnessRecord ?, ?, ?, ?",
                memberid,
                calorieintake,
                weight_lbs,
                height,
            ) # Changed variable name

            # Commit the transaction
            connection.commit()

            # Display a pop-up notification for successful insertion
            messagebox.showinfo("Success", "Record added successfully!")
            root.destroy()

        except Exception as e:
            messagebox.showerror("Error", f"Error occurred: {e}")

    finally:
        # Close the cursor and connection
        if cursor:
            cursor.close()
        if connection:
            connection.close()

# GUI setup for inserting fitness record

```

```

root = tk.Tk()
root.title("Insert Fitness Record")

label_memberid = tk.Label(root, text="Member ID:")
entry_memberid = tk.Entry(root)

label_calorieintake = tk.Label(root, text="Calorie Intake:")
entry_calorieintake = tk.Entry(root)

label_weight_lbs = tk.Label(root, text="Weight (Lbs):")
entry_weight_lbs = tk.Entry(root)

label_height = tk.Label(root, text="Height (Inches):")
entry_height = tk.Entry(root)

button_insert = ttk.Button(root, text="Add Fitness Record", command=insertData)

label_memberid.grid(row=1, column=0, padx=10, pady=5)
entry_memberid.grid(row=1, column=1, padx=10, pady=5)

label_calorieintake.grid(row=2, column=0, padx=10, pady=5)
entry_calorieintake.grid(row=2, column=1, padx=10, pady=5)

label_weight_lbs.grid(row=3, column=0, padx=10, pady=5)
entry_weight_lbs.grid(row=3, column=1, padx=10, pady=5)

label_height.grid(row=4, column=0, padx=10, pady=5)
entry_height.grid(row=4, column=1, padx=10, pady=5)

button_insert.grid(row=6, columnspan=2, padx=10, pady=5)

root.mainloop()

# View Member Button: Main GUI
def open_membership_checker():
    # Function to select member ID
    def select():
        try:
            connection = pyodbc.connect(
                "Driver={SQL Server};"
                + sql_server
                + "Database=GymProgressTracker;"
                + "Trusted_Connection=True"
            )
            cursor = connection.cursor()

            cursor.execute(f"select * from Members where Memberid = {entry_id.get()}")

            # Access the data with a for loop
            data_found = False
            for data in cursor:
                info_label.configure(
                    text=f"Name: {data[1]} {data[2]}\n"
                    f"Membership Type: {data[9]}\n"
                    f"Membership Start: {data[7]}\n"
                    f"Membership End: {data[8]}"
                )
                data_found = True

            if not data_found:
                messagebox.showerror(
                    "No Data Found", "No member with the given ID was found."
                )

        except Exception as e:
            messagebox.showerror("Error", f"Error occurred: {e}")

        finally:
            if cursor:
                cursor.close()
            if connection:
                connection.close()

```

```

app = tk.Tk()
app.title("Membership Checker")
# app.geometry("250x250") # Adjust the size of the window

# Entry object
entry_table_name = tk.Label(app, text="Enter Member ID:")
# entry_id = customtkinter.CTkEntry(app, placeholder_text="ID")
entry_id = tk.Entry(app)

# Label to display information
info_label = tk.Label(app, text="")
select_button = ttk.Button(app, text="View Member", command=select)

entry_table_name.grid(row=1, column=0, padx=10, pady=5)
entry_id.grid(row=2, column=0, padx=10, pady=5)
select_button.grid(row=3, column=0, padx=10, pady=5)
info_label.grid(row=4, column=0, padx=10, pady=5)

app.mainloop()

# View Fitness Record Button: Main GUI
def open_member_data_viewer():
    # Function to show weight trend
    def show_weight_trend(rows):
        # Extracting data for plotting
        dates = [row[1] for row in rows]
        weights = [row[8] for row in rows]

        # Determine the step size for the x-axis ticks
        step = max(len(dates) // 5, 1)

        # Creating the line graph
        plt.figure(figsize=(10, 6))
        plt.plot(dates, weights, marker="o", linestyle="-")
        plt.title("Weight Trend")
        plt.xlabel("Date")
        plt.ylabel("Weight (lbs)")
        plt.xticks(dates[::step], rotation=45) # Set x-axis ticks with step size
        plt.ylim(65, 250) # Set y-axis limits
        plt.grid(True)
        plt.tight_layout()
        plt.show()

    # Function to view member data
    def view_member_data():
        try:
            member_id = entry_member_id.get()
            connection = pyodbc.connect(
                "Driver={SQL Server};"
                + sql_server
                + "Database=GymProgressTracker;"
                + "Trusted_Connection=True"
            )
            cursor = connection.cursor()
            cursor.execute(
                "SELECT * FROM vwTrainerNutritionTraining WHERE MemberID = ?", member_id
            )
            rows = cursor.fetchall() # Fetch all rows instead of just one

            if rows:
                view_window = tk.Tk()
                view_window.title(f"Member Data for Member ID: {member_id}")

                # Define columns
                column_names = [
                    cursor.description[i][0] for i in range(len(cursor.description))
                ]
                visible_columns = column_names[1:] # Exclude the first column
                # print(column_names)

                tree = ttk.Treeview(
                    view_window, columns=visible_columns, show="headings"
                )

```

```

# Configure vertical scrollbar
vsb = ttk.Scrollbar(view_window, orient="vertical", command=tree.yview)
vsb.pack(side="right", fill="y")
tree.configure(yscrollcommand=vsb.set)

# Configure horizontal scrollbar
hsb = ttk.Scrollbar(
    view_window, orient="horizontal", command=tree.xview
)
hsb.pack(side="bottom", fill="x")
tree.configure(xscrollcommand=hsb.set)

for col in visible_columns:
    tree.heading(col, text=col)
    # Adjust column width based on content
    max_width = max(
        [
            len(str(row[i]))
            for row in rows
            for i in range(1, len(row))
            if isinstance(row[i], (int, float))
        ]
        + [len(col)]
    )
    tree.column(
        col, width=max_width * 10
    ) # Adjust based on content length

for (
    row
) in (
    rows
): # Insert each row into the Treeview, excluding the first column
    formatted_row = [
        round(value, 2) if isinstance(value, float) else value
        for value in row[1:]
    ] # Exclude the first column
    tree.insert("", "end", values=formatted_row)

tree.pack(expand=True, fill="both")

# Function to display the line graph
def show_graph():
    show_weight_trend(rows)

# Button to display the line graph
btn_show_graph = Button(
    view_window, text="Show Weight Trend Graph", command=show_graph
)
btn_show_graph.pack()

view_window.mainloop()
else:
    messagebox.showerror(
        "No Data", "No data found for the provided Member ID."
    )

except Exception as e:
    messagebox.showerror("Error", f"Error occurred: {e}")

finally:
    if cursor:
        cursor.close()
    if connection:
        connection.close()

root = tk.Tk()
root.title("Member Data Viewer")
root.geometry("200x100")

member_id_label = tk.Label(root, text="Enter Member ID:")
member_id_label.pack(pady=5)
entry_member_id = tk.Entry(root)

```

```

entry_member_id.pack(pady=5)

view_button = tk.Button(root, text="View Fitness Record", command=view_member_data)
view_button.pack(pady=5)

root.mainloop()

# Function to open the Main GUI Window
def open_main_window():
    main_screen = customtkinter.CTk()
    main_screen.geometry("300x200")
    main_screen.title("Gym Progress Tracker")

    insert_members_button = customtkinter.CTkButton(
        main_screen, text="Add Member", command=open_insert_members
    )
    insert_members_button.place(relx=0.27, rely=0.1)

    payment_button = customtkinter.CTkButton(
        main_screen, text="Submit Payment", command=open_payment_submission
    )
    payment_button.place(relx=0.27, rely=0.27)

    insert_record_button = customtkinter.CTkButton(
        main_screen, text="Add Fitness Record", command=open_insert_record
    )
    insert_record_button.place(relx=0.27, rely=0.44)

    membership_checker_button = customtkinter.CTkButton(
        main_screen, text="View Member", command=open_membership_checker
    )
    membership_checker_button.place(relx=0.27, rely=0.61)

    view_member_data_button = customtkinter.CTkButton(
        main_screen, text="View Fitness Record", command=open_member_data_viewer
    )
    view_member_data_button.place(relx=0.27, rely=0.78)

    main_screen.mainloop()

# Call Main GUI Window
open_main_window()

```

Link back to Front End GUI: [5.2.2](#)

C. Gym Progress Tracker DB Users

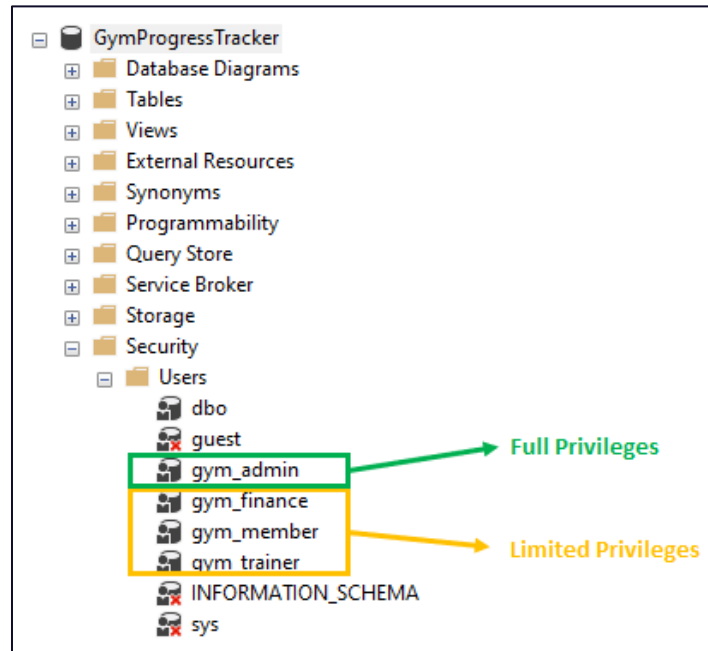


Figure 10. GymProgressTracker Database Users.

References

1. COSC 304 – Introduction to Database Systems: ER to Relational Mapping from UBC
File: 304_11_ER_to_Relational(2).pdf
2. Maintenance Calorie Calculator
Link: <https://www.inchcalculator.com/maintenance-calorie-calculator/>
3. BMI Calculator
Link: <https://www.inchcalculator.com/bmi-calculator/>
4. CPRO 1301 – Database Security from RDP by Muhammad Tufail, PhD
File: Winter2024_CPRO_1301_Week12_Database_Security_v2.docx
5. Mockaroo – Random Data Generator
Link: <https://mockaroo.com/>
6. CPRO 1301 – Database Objects I (Views) from RDP by Muhammad Tufail, PhD
File: []-Winter2024_CPRO_1301_Week10_Ch13_Views.pptx
7. CPRO 1301 – Database Objects I from RDP by Muhammad Tufail, PhD
File: []-Winter2024_CPRO_1301_Week11a_Ch14_Scripts.pptx
8. CPRO 1301 – Database Objects II from RDP by Muhammad Tufail, PhD
File: []-Winter2024_CPRO_1301_Week11b_Ch15_Stored_Procedures_Functions_Triggers.pptx