1. Entities and Their Attributes

- **Gymnasium**
  - *Attributes:*
    - **GymName** (Primary Key)
    - Address
    - TelephoneNumber
- **Member**
  - *Attributes:*
    - **MemberID** (Primary Key)
    - LastName
    - FirstName
    - Address
    - DateOfBirth
    - Gender
  - *Note:* Each member registers at **one** gymnasium.
- **Session**
  - *Attributes:*
    - **SessionID** (Primary Key)
    - SportType
    - Schedule
    - (Business rule: Maximum capacity is 20 members)
  - *Note:* A session is usually offered by a gymnasium (you might model a relationship with Gymnasium if sessions are specific to a location).
- **Coach**
  - *Attributes:*
    - **CoachID** (Primary Key) *(or you could use a composite key of LastName/FirstName if unique)*
    - LastName
    - FirstName
    - Age
    - Specialty
  - *Note:* A session is led by at most **two** coaches.

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2. Relationships

1. **Gymnasium–Member (One-to-Many)**
   - **Description:**
     Each gymnasium has many members registered, but each member registers at only one gymnasium.
   - **Cardinality:**
     - Gymnasium: 1 — N : Member
2. **Gymnasium–Session (One-to-Many) (Optional)**
   - **Description:**
     If sessions are offered at specific gymnasiums, then one gymnasium can offer many sessions, while each session is held in one gymnasium.
   - **Cardinality:**
     - Gymnasium: 1 — N : Session

3. **Session–Member (Many-to-Many)**
    o **Description:**
      Members register for sessions. A session can have many members (up to 20),
      and a member might register for several sessions.
    o **Implementation:**
      Use an associative entity (e.g., **Registration**) with at least:
        ▪ **MemberID** (Foreign Key)
        ▪ **SessionID** (Foreign Key)
        ▪ (Optional attributes such as registration date, etc.)
    o **Cardinality:**
        ▪ Session: 0..20 — M : Registration — M : Member
4. **Session–Coach (Many-to-Many with a Constraint)**
    o **Description:**
      A session is led by one or two coaches, and a coach may lead multiple
      sessions.
    o **Implementation:**
      Use an associative entity (e.g., **SessionCoach**) with:
        ▪ **SessionID** (Foreign Key)
        ▪ **CoachID** (Foreign Key)
    o **Cardinality:**
        ▪ Session: 1..2 — M : SessionCoach — M : Coach

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3. Diagram Representation

Below is a simplified diagram in text form. (In an actual ER diagram, you'd use proper
diagramming notation.)

```
[Gymnasium]
   |-- GymName (PK)
   |-- Address
   |-- TelephoneNumber
     |
     | 1 --------- N
     |
[Member]
   |-- MemberID (PK)
   |-- LastName
   |-- FirstName
   |-- Address
   |-- DateOfBirth
   |-- Gender

(Optional: Gymnasium also 1 --------- N [Session])
   |
[Session]
   |-- SessionID (PK)
   |-- SportType
   |-- Schedule
   |-- (Capacity = 20 max)
     | \
     |  \ (Many-to-Many via Registration)
     |   \
     |    \
```

```
    [Registration]
       |-- MemberID (FK)
       |-- SessionID (FK)
       |
       | (Many-to-Many)
       |
    [Member]

[Session]
    | \
    |  \ (Many-to-Many via SessionCoach; max 2 per session)
    |   \
[SessionCoach]
    |-- SessionID (FK)
    |-- CoachID (FK)
       |
       | (Many-to-Many)
       |
[Coach]
    |-- CoachID (PK)
    |-- LastName
    |-- FirstName
    |-- Age
    |-- Specialty
```

4. Business Rules Recap

- **Members** register at one **Gymnasium**.
- A **Gymnasium** can have many **Members** (and possibly many **Sessions**).
- **Sessions** are characterized by sport type and schedule, and each can host up to **20 Members**.
- A **Session** is led by **one or two Coaches**.
- **Members** may register for multiple **Sessions** (and vice versa), so a **Registration** relationship is needed.
- **Coaches** may lead multiple **Sessions**, but each session's coaching team is limited to a maximum of two coaches.

5. Final Notes

This ER model offers a clear separation of concerns:

- **Gymnasium** holds location and contact details.
- **Member** captures the personal details of clients.
- **Session** defines the scheduled activities.
- **Coach** identifies the session leaders.