Mental Math Web Application - Documentation

1. Introduction

The **Mental Math Web Application** is a simple and interactive platform that allows users to practice arithmetic operations and track their progress. The application provides user authentication, question generation, answer verification, and a leaderboard system. It is built using **Go (Golang)** with SQLite as the database.

2. Tech Stack

- **Backend**: Go (Gorilla Mux, Gorilla Sessions, OAuth2)
- **Database**: SQLite
- **Frontend** (if applicable): HTML, JavaScript

3. Features

3.1 User Authentication

- **Manual Login & Registration**: Users sign up using a username and password.
- **GitHub OAuth Login**: Users can log in using their GitHub credentials.
- **Session Management**: Managed using Gorilla Sessions and HTTP cookies.

3.2 Random Math Question Generation

- Generates random arithmetic questions (addition, subtraction, multiplication).
- Dynamically adjusts difficulty levels.
- Stores correct answers temporarily for validation.

3.3 Answer Verification & Fun Facts

- Compares user input with the correct answer.
- Displays the correct answer if incorrect.
- Fetches a fun number fact using an external API.

3.4 Leaderboard System

- Tracks user scores and response times.
- Ranks users based on the number of correct answers and speed.

4. API Endpoints

Endpoint	Method	Description
/api/register	POST	Registers a new user
/api/login	POST	Logs in a user and starts a session
/api/questions/random	GET	Fetches a random math question
/api/questions/verify	POST	Verifies user answer
/api/leaderboard	GET	Retrieves leaderboard rankings

5. Security Measures

- **bcrypt Hashing** for secure password storage.
- **OAuth2 Authentication** for GitHub login.
- **Session Management** using HTTP cookies.
- **Parameterized Queries** to prevent SQL Injection.

6. Deployment & Execution

Local Execution

1.Install dependencies:
 go mod tidy

2.Run the server:
 go run main.go

3.Test API using Postman or curl.

Deployment Options

- Deployable on **Heroku**, **Render**, or **AWS Lambda**.

7. Challenges & Future Enhancements

Challenges Faced

- Implementing **OAuth authentication**.
- Efficient **session handling**.

Future Enhancements

- Timer-based quizzes.
- More question types (division, algebra).
- Mobile app version using React Native.

8. Conclusion

The **Mental Math Web Application** provides a fun and educational way to improve arithmetic skills. It is built with secure authentication, scalable architecture, and extensible design for future improvements.