

NumberMind - Logic Building Game

Complete Project Documentation

1. PROJECT TITLE

NumberMind: Multiplayer Logic Deduction Game

2. PROJECT IDEA

A real-time multiplayer mobile game that challenges players' logical reasoning and deductive skills through number guessing mechanics. Players engage in strategic battles of wit, trying to crack their opponent's secret 4-digit code using minimal clues and maximum brain power.

3. DETAILED DESCRIPTION

3.1 Core Game Concept

NumberMind is a digital adaptation of the classic "Bulls and Cows" logic game, enhanced with modern mobile features and social gameplay elements. Two players compete to guess each other's unique 4-digit number (no repeated digits) using deductive reasoning and strategic thinking.

3.2 Game Mechanics

Setup Phase:

- Each player selects a secret 4-digit number (digits 0-9, no repetitions)
- Numbers are hidden from the opponent
- Example: Player 1 chooses **9843**, Player 2 chooses **3467**

Gameplay Loop:

1. **Turn-based guessing:** Players alternate making guesses
2. **Feedback system:** After each guess, the opponent provides two key metrics:
 - **Correct Digits:** How many digits in the guess appear in the secret number
 - **Correct Positions:** How many digits are in the exact right position

3. **Deduction phase:** Players use feedback to narrow down possibilities

4. **Victory condition:** First player to guess the exact number wins

Example Round:

Player 1's Secret: 9843

Player 2 guesses: 7324

Feedback: "2 correct digits, 0 in correct positions"

(Digits 3 and 4 exist in 9843, but none are in right positions)

3.3 Enhanced Features

Difficulty Levels:

- **Beginner:** 3-digit numbers
- **Standard:** 4-digit numbers
- **Expert:** 5-digit numbers
- **Master:** 6-digit numbers with time pressure

Game Modes:

- **Friend Challenge:** Invite specific friends
- **Random Opponent:** Matched with online players
- **AI Practice:** Train against intelligent bot
- **Daily Challenge:** Special puzzles with unique rewards

Social Features:

- **Friends List:** Add and challenge friends
- **Leaderboards:** Track wins, streaks, and fastest solves
- **Achievement System:** Unlock badges for special accomplishments
- **Replay System:** Review and share exceptional games

Engagement Systems:

- **Streak Rewards:** Bonus points for consecutive wins
- **Time Bonuses:** Extra points for quick solutions
- **Perfect Games:** Special recognition for optimal play

- **Seasonal Events:** Limited-time challenges and themes
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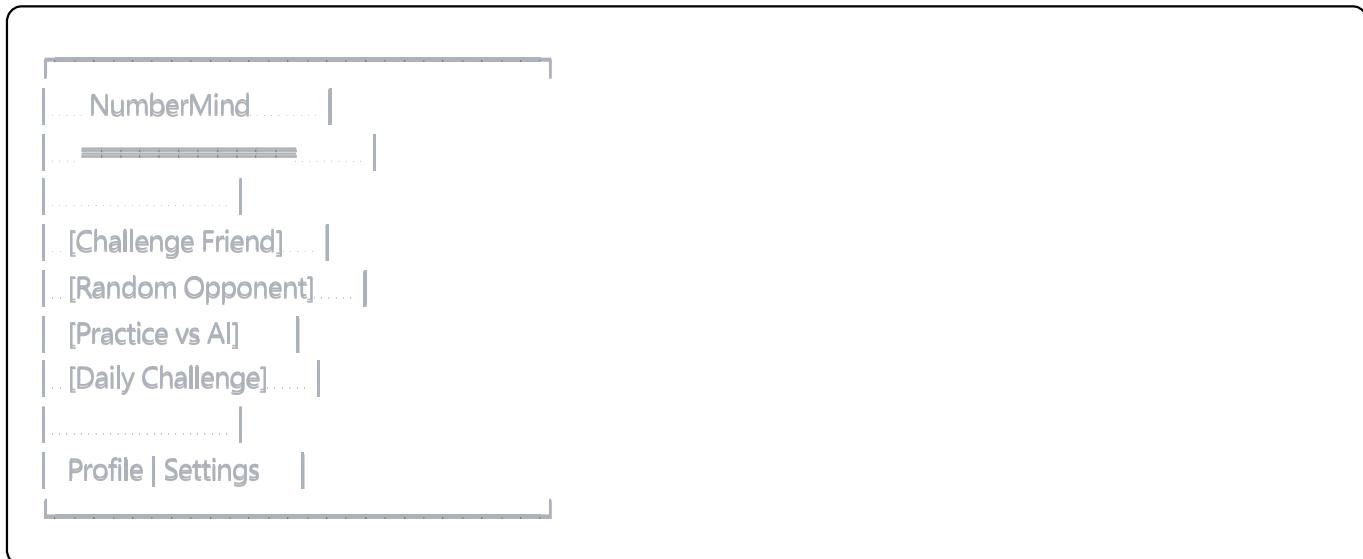
4. UI/UX DESIGN SPECIFICATIONS

4.1 Visual Design Philosophy

- Clean, minimal interface focusing on numbers and feedback
- High contrast colors for accessibility
- Smooth animations for feedback and transitions
- Mobile-first design optimized for thumb navigation

4.2 Key Screens and Layout

Main Menu Screen:



Game Setup Screen:

Choose Your Secret Number

[Number Pad]

[Confirm Selection]

Main Game Screen:

Player1 vs Player2

3 2

Your Guesses History

1234	2C, 1P	
5678	1C, 0P	

Next Guess:

[Submit Guess]

Feedback Screen:



4.3 Interactive Elements

Smart Number Pad:

- **Highlights used digits** in current guess
- **Grays out repeated digits** for validation
- **Haptic feedback** on selection
- **Quick clear/backspace** functionality

Visual Feedback System:

- **Green indicators** for correct positions
- **Yellow indicators** for correct digits
- **Animated counters** showing progress
- **Particle effects** for successful guesses

Status Indicators:

- **Turn indicator:** Clear visual showing whose turn it is
- **Connection status:** Online/offline indicators
- **Timer display:** Optional countdown for timed games
- **Streak counters:** Current win streaks displayed

4.4 Accessibility Features

- **Large, readable fonts** (minimum 16px)

- High contrast mode support
 - Voice feedback for visually impaired users
 - Simplified UI mode for cognitive accessibility
 - Customizable color themes for color-blind users
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5. TECHNICAL ARCHITECTURE

5.1 Technology Stack

- Frontend: React Native (iOS & Android)
- Backend: Node.js with Express
- Database: MongoDB for user data, Redis for real-time game state
- Real-time Communication: Socket.io for multiplayer functionality
- Authentication: Firebase Auth or Auth0
- Push Notifications: Firebase Cloud Messaging

5.2 Key Components

Game Logic Engine:

```
javascript

class GameEngine {
  - validateNumber(number)
  - calculateFeedback(guess, secret)
  - checkWinCondition(guess, secret)
  - generateAIGuess(difficulty, history)
}
```

Multiplayer Manager:

```
javascript
```

```
class MultiplayerManager {  
    ... - createGameRoom(players)  
    ... - handlePlayerMove(gameId, playerId, guess)  
    ... - broadcastGameState(gameId, state)  
    ... - handleDisconnection(playerId)  
}
```

User Profile System:

javascript

```
class UserProfile {  
    ... - updateStats(gameResult)  
    ... - calculateRanking()  
    ... - manageAchievements()  
    ... - handleFriendRequests()  
}
```

5.3 Data Models

User Model:

json

```
{
  "userId": "unique_id",
  "username": "player_name",
  "email": "email@example.com",
  "stats": {
    "gamesPlayed": 0,
    "gamesWon": 0,
    "currentStreak": 0,
    "bestTime": 0,
    "averageGuesses": 0
  },
  "friends": ["friend_id_1", "friend_id_2"],
  "achievements": ["achievement_1", "achievement_2"],
  "settings": {
    "soundEnabled": true,
    "notifications": true,
    "difficulty": "standard"
  }
}
```

Game Session Model:

```
json
{
  "gameId": "unique_game_id",
  "players": [
    {
      "playerId": "player_1_id",
      "secretNumber": "9843",
      "guesses": [
        {"guess": "1234", "feedback": {"correct": 1, "position": 0}}
      ]
    }
  ],
  "currentTurn": "player_1_id",
  "status": "active",
  "startTime": "timestamp",
  "mode": "friend_challenge"
}
```

6. EXPECTED OUTPUTS

6.1 Core Deliverables

1. Mobile Application (iOS & Android)

- Complete game functionality
- User authentication and profiles
- Real-time multiplayer capability
- Offline AI practice mode

2. Backend Services

- Game state management
- User data persistence
- Matchmaking system
- Real-time communication

3. Admin Dashboard

- User management
- Game analytics
- Performance monitoring
- Content management

6.2 Success Metrics

- **User Engagement:** Average session duration > 10 minutes
- **Retention:** Day 7 retention rate > 40%
- **Performance:** Game response time < 200ms
- **User Satisfaction:** App store rating > 4.2 stars
- **Technical:** 99.9% uptime, crash rate < 0.1%

6.3 Launch Strategy

1. **Beta Testing:** 100 users, 2 weeks testing period
2. **Soft Launch:** Limited geographic release
3. **Full Launch:** Global release with marketing campaign
4. **Post-Launch:** Regular updates with new features

7. DEVELOPMENT PHASES

Phase 1: Core Game (4-6 weeks)

- Basic game logic implementation
- Single-device two-player mode
- Essential UI components
- Input validation and feedback system

Phase 2: Multiplayer Foundation (3-4 weeks)

- Real-time multiplayer infrastructure
- User authentication system
- Basic matchmaking
- Connection handling and error recovery

Phase 3: Social Features (3-4 weeks)

- Friends system
- User profiles and statistics
- Basic achievement system
- Game history and replay

Phase 4: Enhancement & Polish (4-5 weeks)

- AI opponent implementation
- Advanced UI/UX features
- Sound effects and animations
- Performance optimization and testing

Phase 5: Launch Preparation (2-3 weeks)

- Beta testing and bug fixes
- App store optimization
- Analytics integration
- Final performance tuning

8. COMPETITIVE ADVANTAGES

1. **Accessibility:** Easy to learn, difficult to master
 2. **Social Gameplay:** Strong friend-based engagement
 3. **Cross-Platform:** React Native ensures broad device coverage
 4. **Scalability:** Cloud-based architecture supports growth
 5. **Monetization Potential:** Premium features, cosmetics, tournaments
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9. RISK MITIGATION

Technical Risks:

- **Real-time performance:** Implement robust connection handling
- **Scalability concerns:** Use cloud services with auto-scaling
- **Platform compatibility:** Extensive device testing

Market Risks:

- **Competition:** Focus on unique social features
 - **User acquisition:** Leverage friend-referral mechanics
 - **Retention:** Regular content updates and events
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10. SUCCESS CRITERIA

Technical Success:

- App launches successfully on both iOS and Android
- Multiplayer games complete without disconnection issues
- Response time under 200ms for all game actions
- Support for 1000+ concurrent users

User Experience Success:

- Intuitive gameplay requires no tutorial for 80% of users
- Average game completion rate > 90%

- User reports "fun and challenging" in feedback surveys

Business Success:

- 10,000 downloads in first month
 - 1,000 daily active users by month 3
 - 4+ star average rating on app stores
 - Positive user retention and engagement metrics
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This document serves as a comprehensive guide for NumberMind development. All specifications are designed to be clear enough for both technical implementation and stakeholder understanding.