

UNIVERSITI TUNKU ABDUL RAHMAN
Faculty of Information and Communication Technology



UCCD3223 Mobile Applications Development
(Feb 2025 Trimester)

Individual Practical Assignment

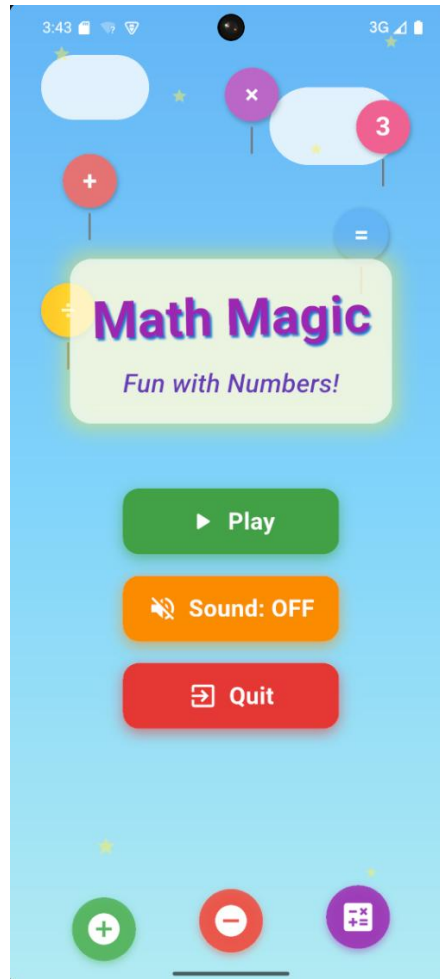
Name	Ng Wei Yu
Student ID	2207448
Course	CS
Practical Group	P9
Lecturer	Mr.Tan Chiang Kang

Marking scheme	Marks	Remarks
Correctness	× 2.5	
Design	× 3.5	
User Friendliness	× 2	
Neat Program Documentation		
Report Format		
TOTAL		

Section 1: Screen

This mobile application is developed by using Flutter. The reason for using Flutter is there are many packages that can be used to build an interactive math app for kids.

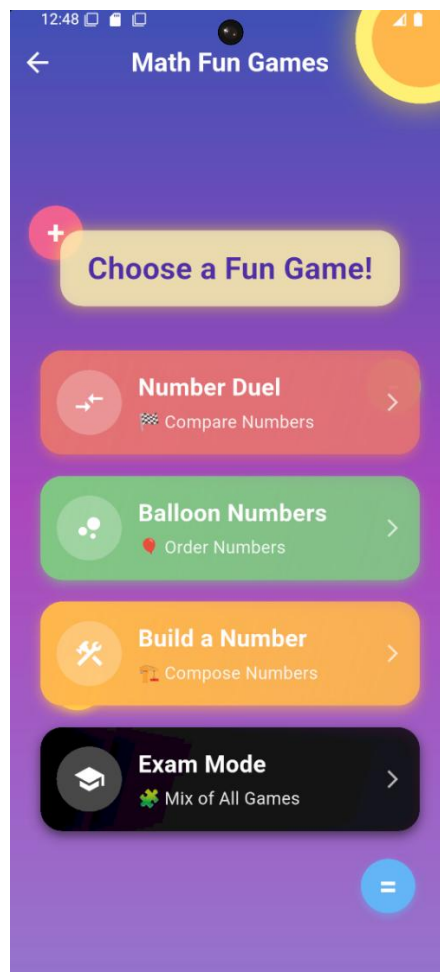
1.1 Start Screen



Picture 1.1.1: Start Screen

The Math Magic app is an educational mathematics game designed for children, featuring a playful and engaging user interface. The start screen showcases a design with a blue-to-cyan gradient background, decorated with animated elements including floating mathematical balloons (displaying symbols like $+$, $=$, \times , 3 , \div), twinkling stars, and decorative clouds. The main title "Math Magic" with its subtitle "Fun with Numbers!" rotates and is presented with a glowing effect against a semi-transparent white background. The interface includes three main interactive buttons: a green "Play" button to start the game, an orange sound toggle button for audio control, and a red "Quit" button to exit the application. At the bottom of the screen, there are bouncing mathematical icons (add, subtract, and calculate) that add to the playful atmosphere. The background music as home music is also integrated inside the app.

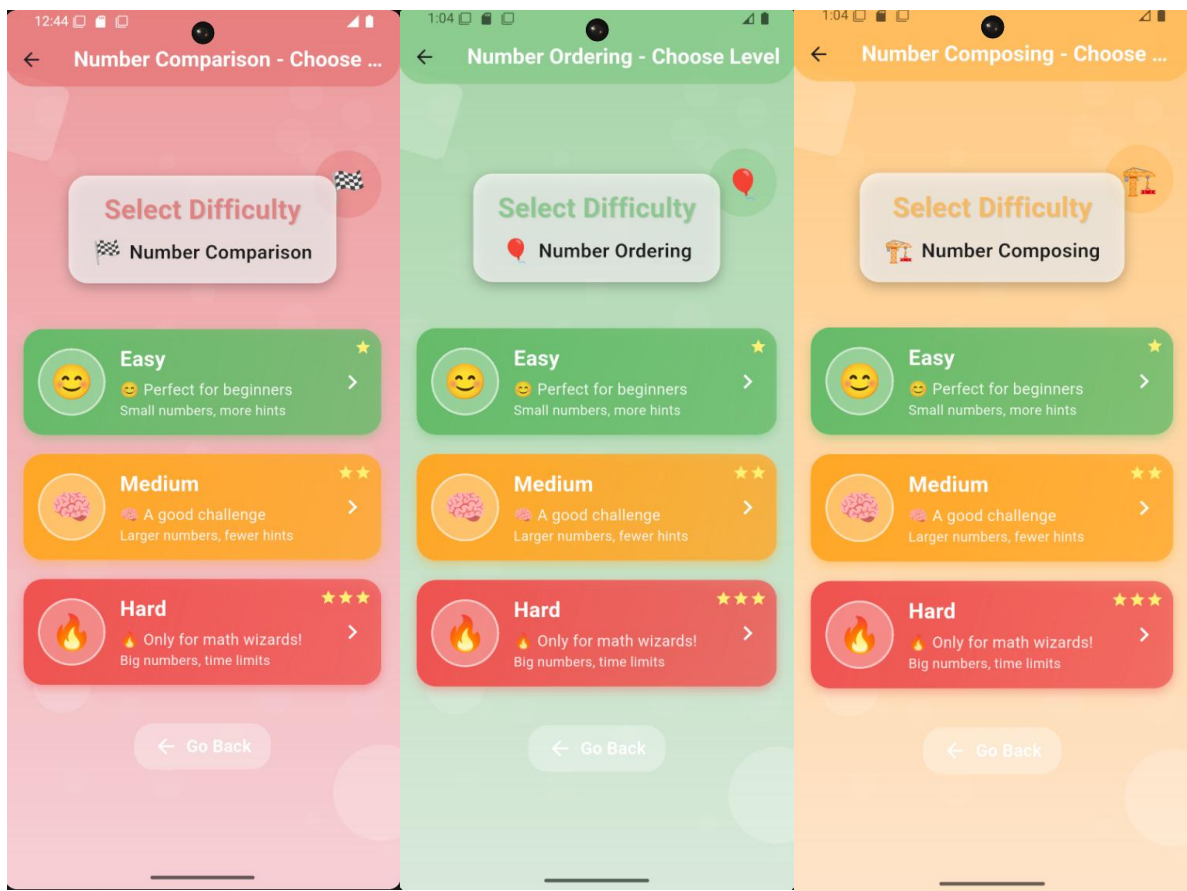
1.2 Home Screen



Picture: 1.2.1 Home Screen

The home screen features a colourful gradient background with animated elements such as a rotating sun/star and floating math symbols. There are four different types of games. The first one is a number comparison game to find the larger or smaller value. The second one is a number ordering game to order the numbers in ascending or descending. The third one is a number composing game to compose numbers to match a target value using addition. The last one is exam mode which combines all the above games into a single challenge.

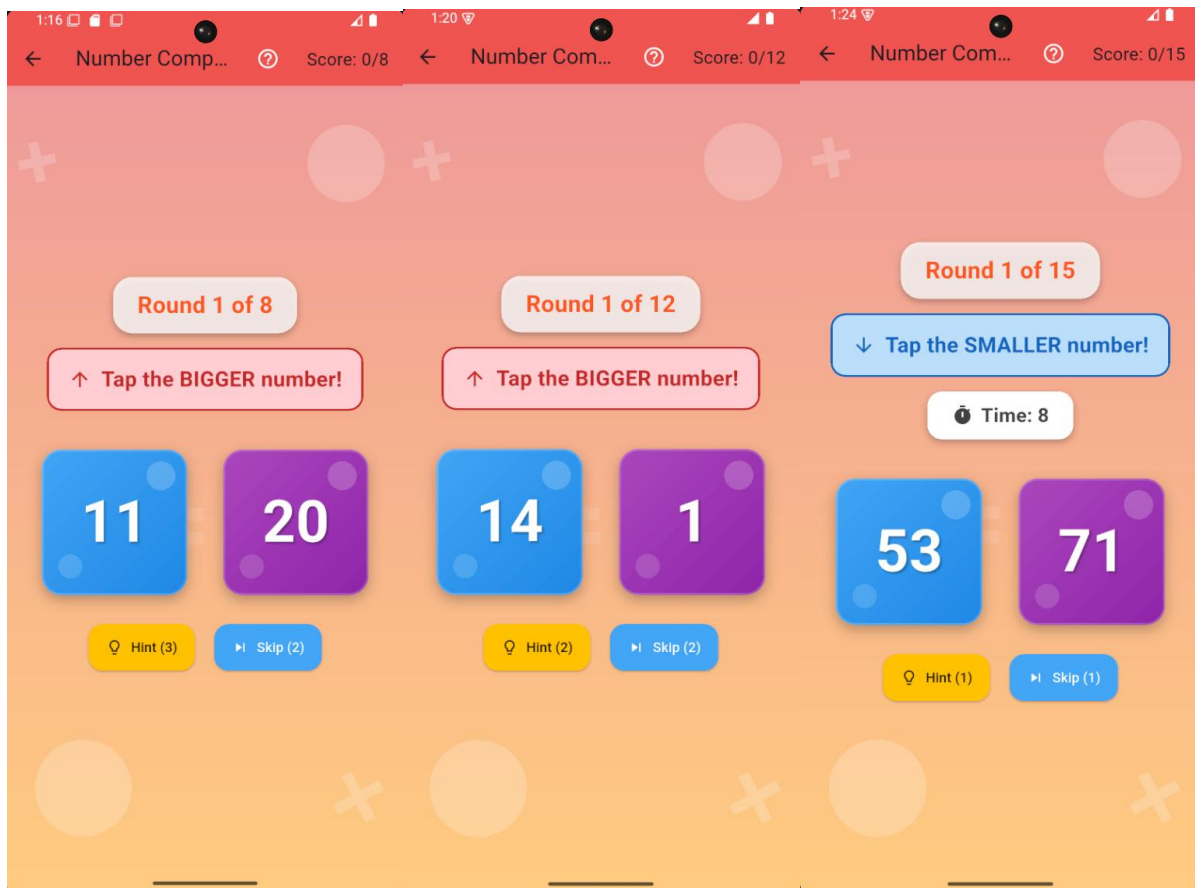
1.3 Difficulty Level Screen



Picture 1.3.1: Difficulty Level Screen (Comparison, Ordering, Composing)

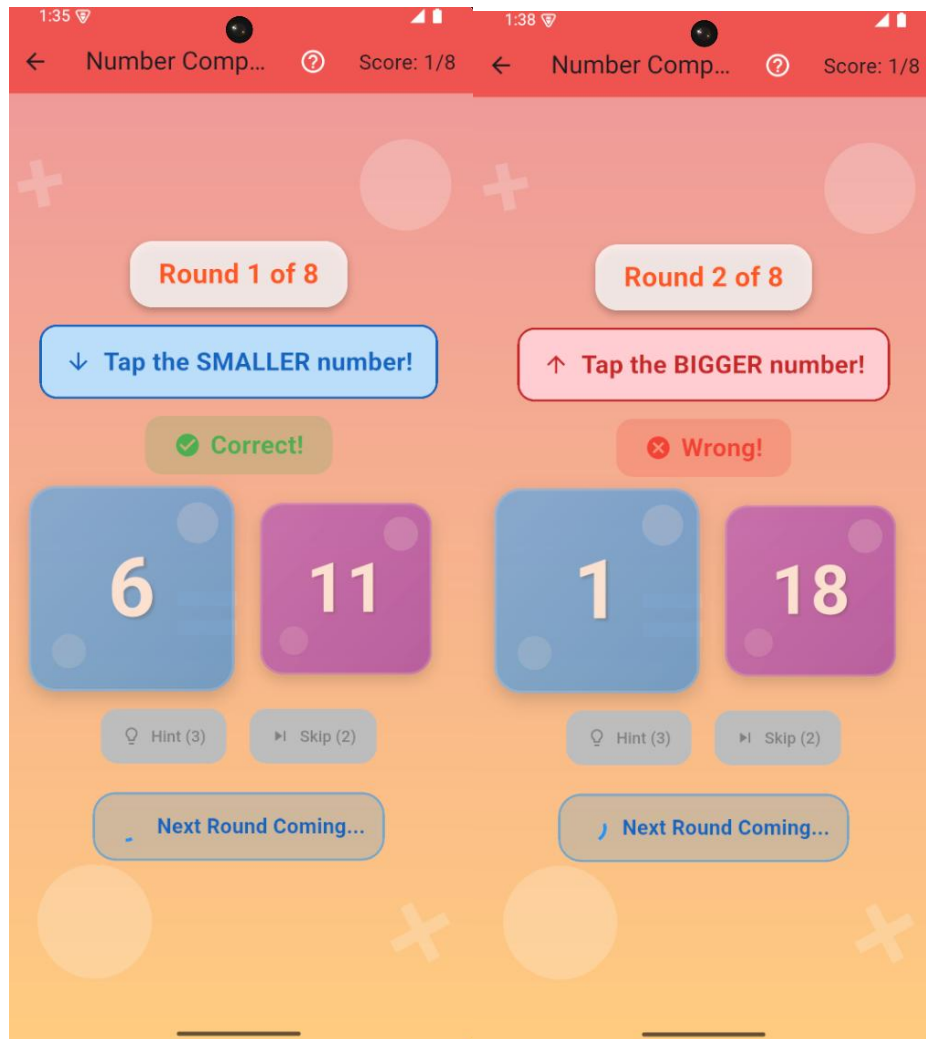
Every game has this difficulty level screen to choose the difficulty level to play. The user can choose the level desired based on their skill to enhance their mathematics level. Also, there are some animated elements such as a race flag, balloon, and construction as the theme of the game. There is also a “return” button to choose their desired game.

1.4 Number Comparison Screen



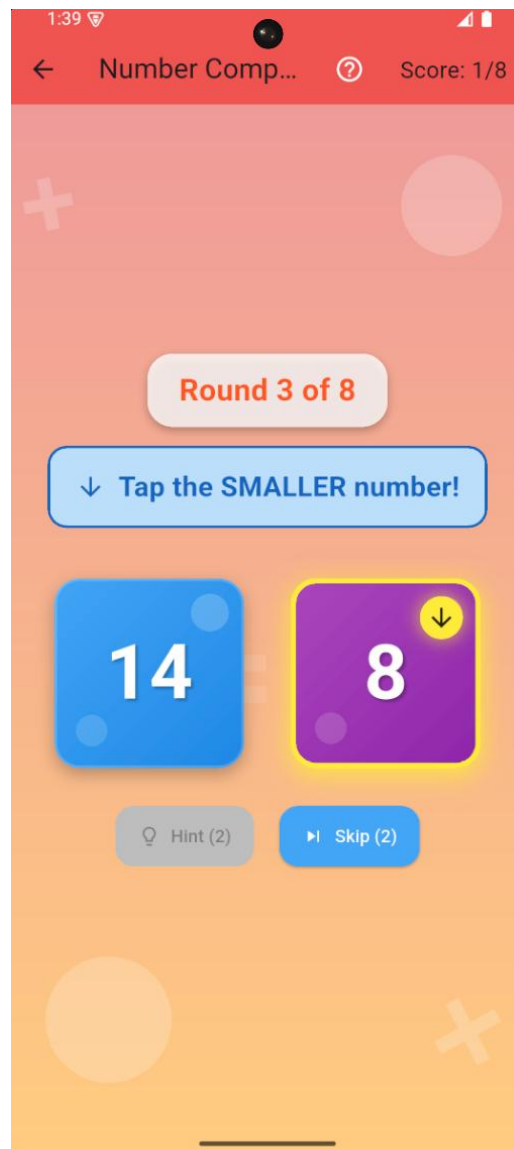
Picture 1.4.1: Number Comparison Screen (Easy, Medium, Hard)

The number comparison game is designed to select a larger or smaller number. At the top, the screen displays the current round and total rounds, along with a timer for hard mode. There are 8, 12 and 15 total rounds for easy, medium and hard modes respectively. The game provides clear instructions such as "Tap the BIGGER number!" or "Tap the SMALLER number!". Furthermore, the number of hints and skips is given based on the difficulty level. Hard mode has a timer which has 10 seconds for every round. The music is also changed from home music to corresponding music. Every game has its music to improve user experience.



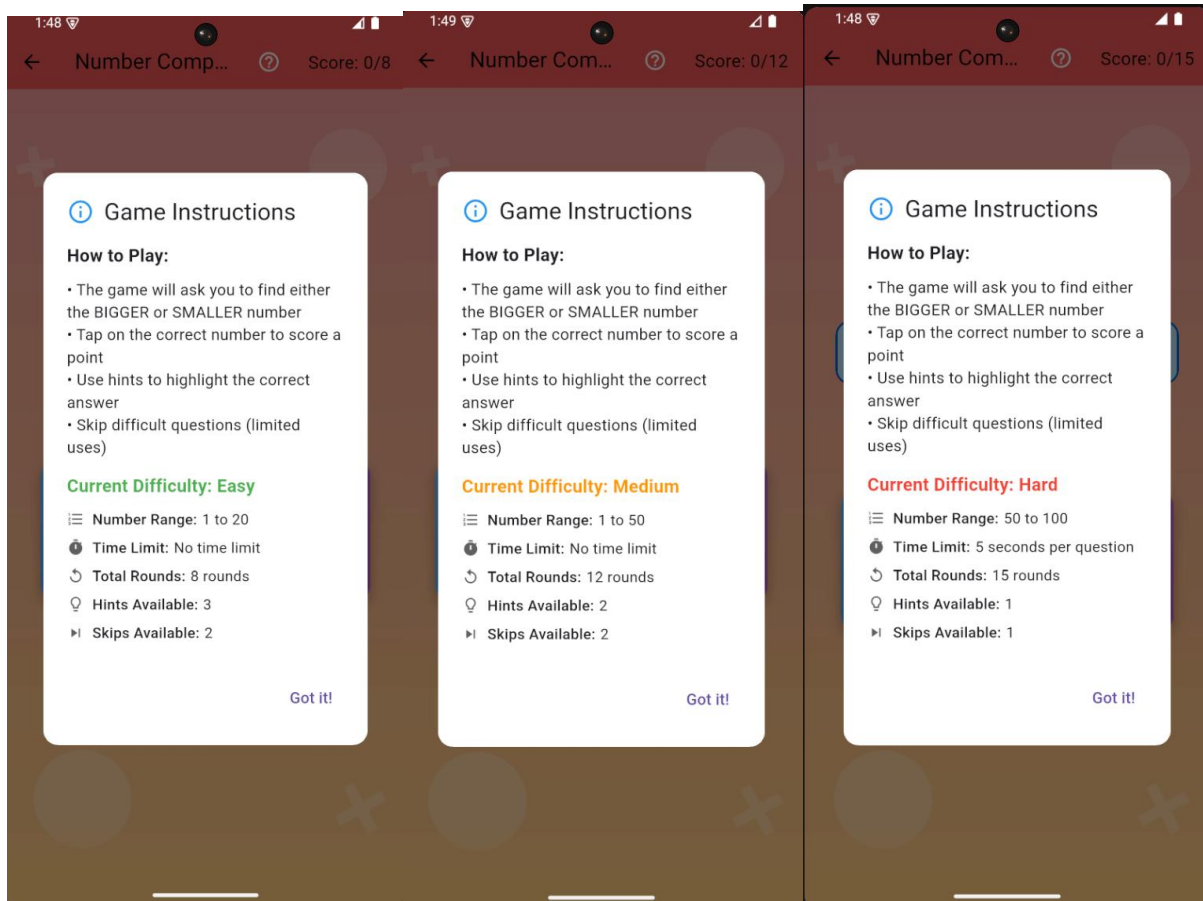
Picture 1.4.2: Answer Feedback

When a player selects a number, the screen provides immediate feedback through animations and sound effects to determine whether the answer is correct or incorrect. A transition animation then prepares the screen for the next round. For hard mode, a timer is displayed, counting down the seconds remaining for the current round. If the timer runs out, the game automatically registers the answer as incorrect and transitions to the next round.



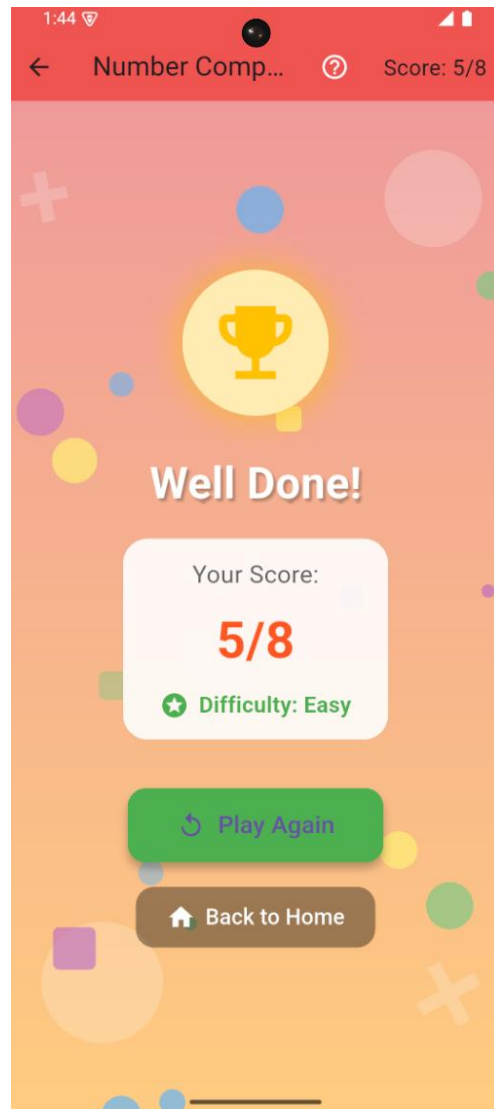
Picture 1.4.3: Hint

The player can use the hints to highlight the correct answer with a glowing border and animation. The skip button also can be used to skip difficult questions.



Picture 1.4.4: Game Instructions (Easy, Medium, Hard)

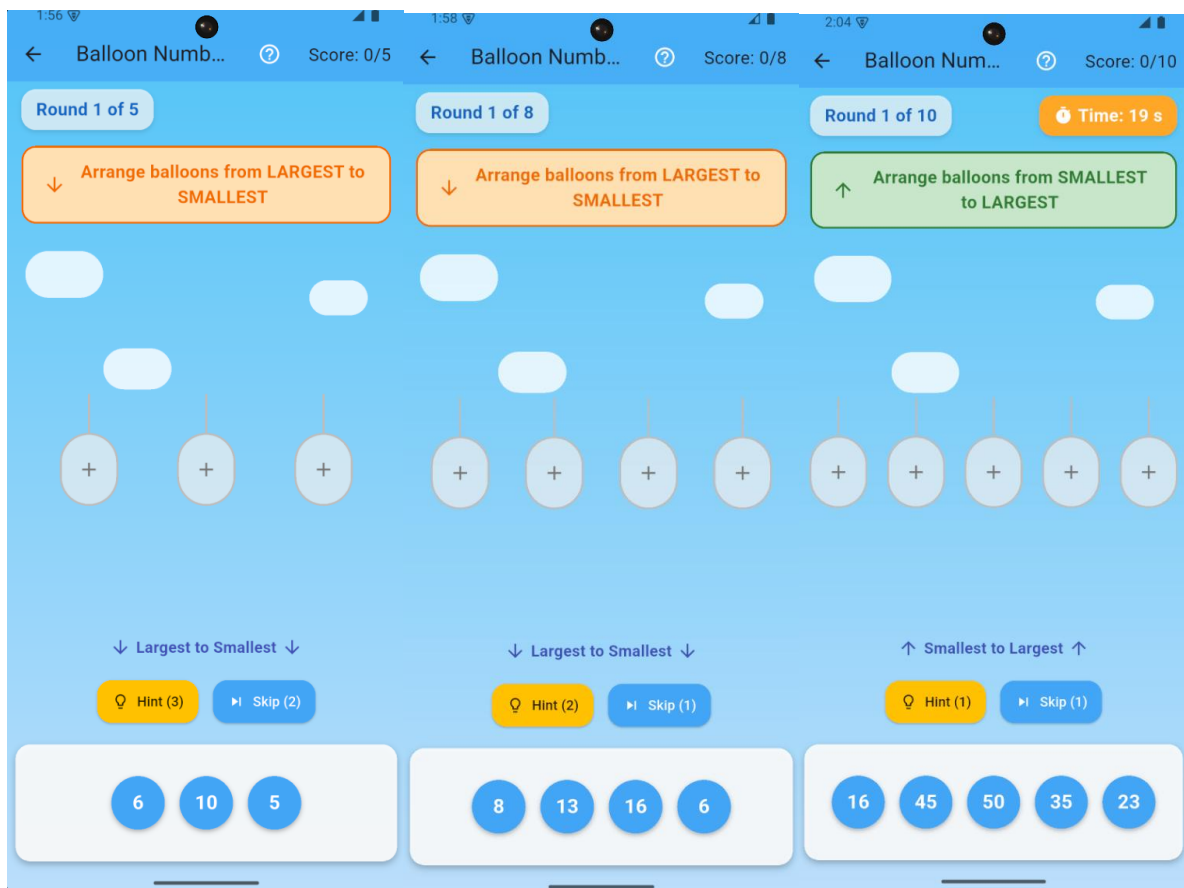
There is a question mark button at the top as a game instruction for every difficulty mode. The number range of questions is different and stated in the instructions. The player can see the number range first before answering the question, especially for the kids. This indeed increases the user experience and makes the app feel more responsive.



Picture 1.4.5: Game Over Screen

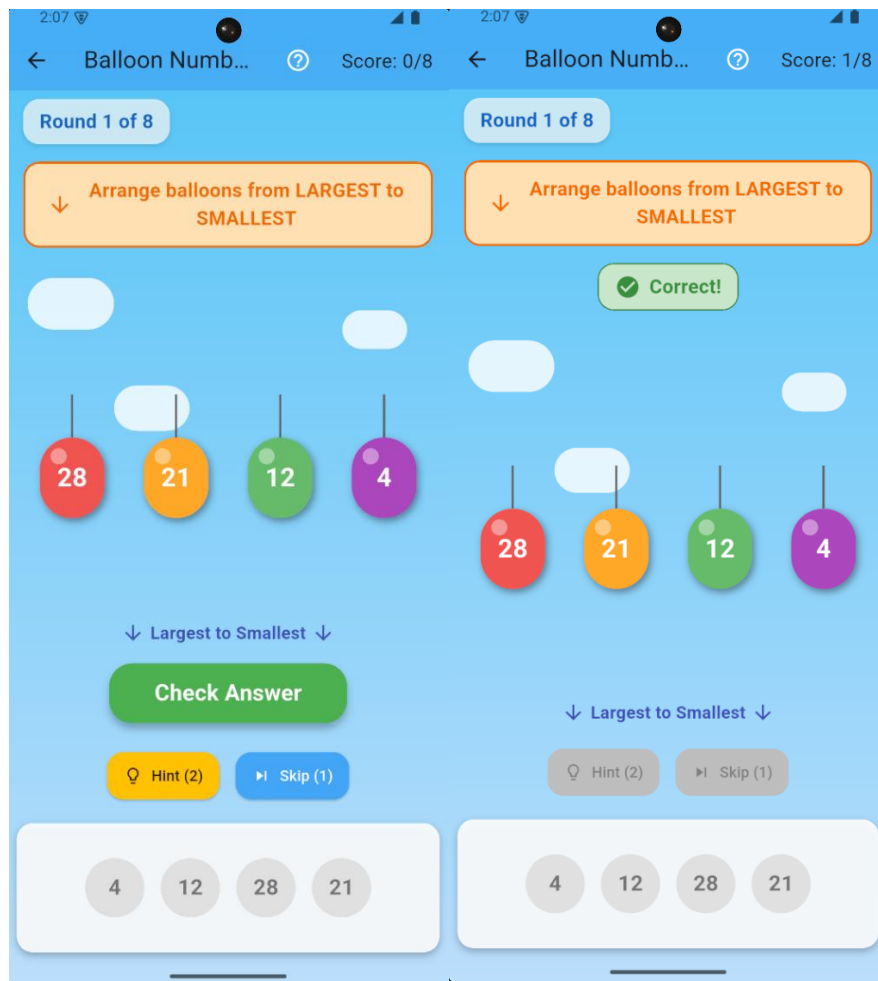
At the end of the game, a congratulatory message, the player's final score, difficulty level, and options to restart the game or return to the home screen will be displayed. The animation is added using `TweenAnimationBuilder` which is a Flutter widget that makes it easy to create smooth, animated transitions between values.

1.5 Number Ordering Screen



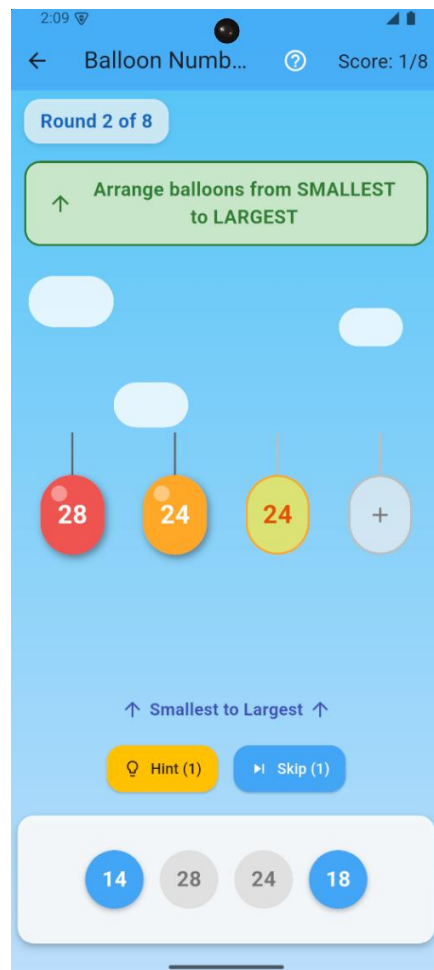
Picture 1.5.1: Number Ordering Screen (Easy, Medium, Hard)

The number-ordering game is designed to challenge players to arrange numbers in either ascending or descending order. The game features a user interface with a gradient sky background and decorative elements such as floating clouds and balloons. At the top of the screen, the current round and total rounds are displayed, along with a timer for hard mode. The game provides clear instructions, such as "Arrange balloons from SMALLEST to LARGEST" or "Arrange balloons from LARGEST to SMALLEST". A set of number balloons is displayed for the user to insert the number according to the order. Players can tap numbers to place them in the slots and tap the numbers again to remove them.



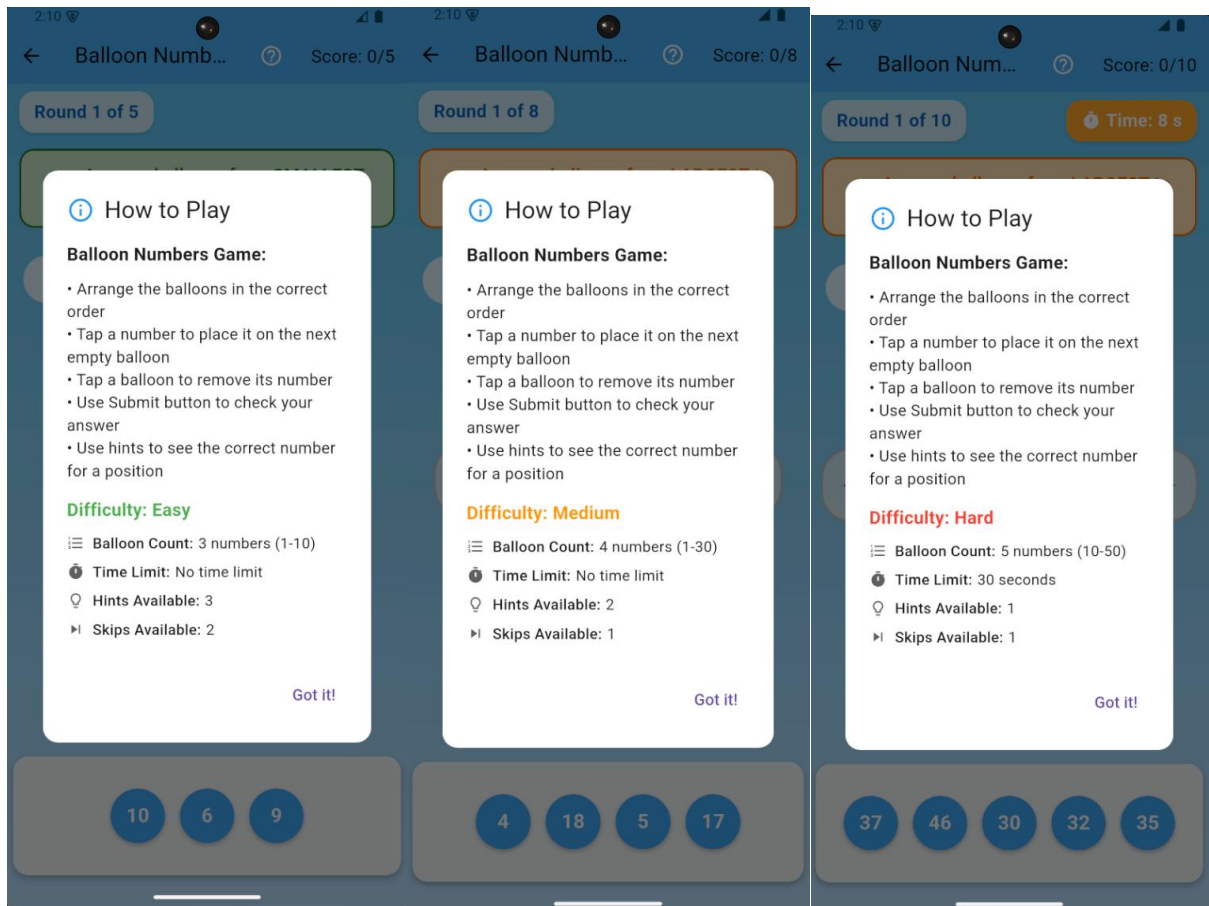
Picture 1.5.2: Answer Feedback

Once all slots are filled, players can submit their answers by tapping the "Check Answer" button, which is animated with a bounce effect to draw attention. The game provides immediate feedback through animations and sound effects, indicating whether the answer is correct or incorrect. If the answer is correct, the player's score increases, and the game transitions to the next round.



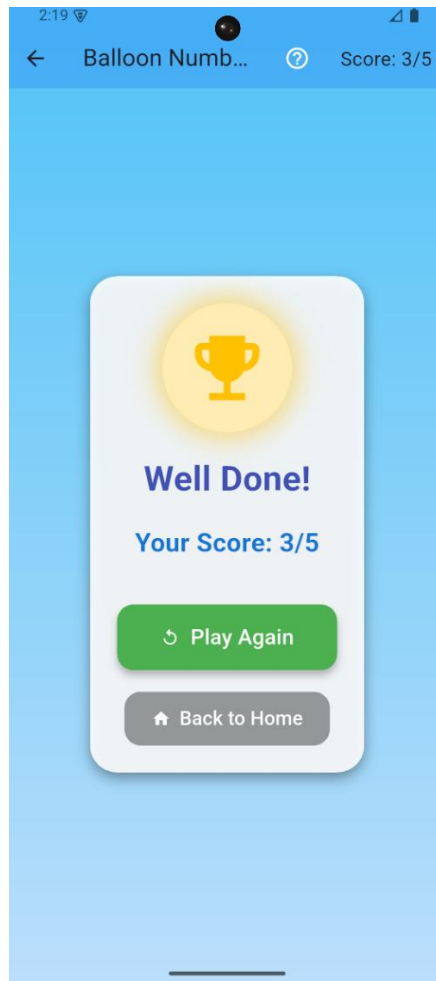
Picture 1.5.3: Hint

If hints are available, players can use them to highlight the correct number for the next balloon slot, with a glowing effect indicating the hint. For example, according to picture 1.5.3, two numbers have occupied the first two positions which are selected by the player, and then the hint will be shown in the third position. In this situation, the number 24 should be in third position. A "Skip" button allows players to skip challenging rounds. Both buttons are dynamically updated based on the player's remaining hints and skips.



Picture 1.5.4: Game Instructions

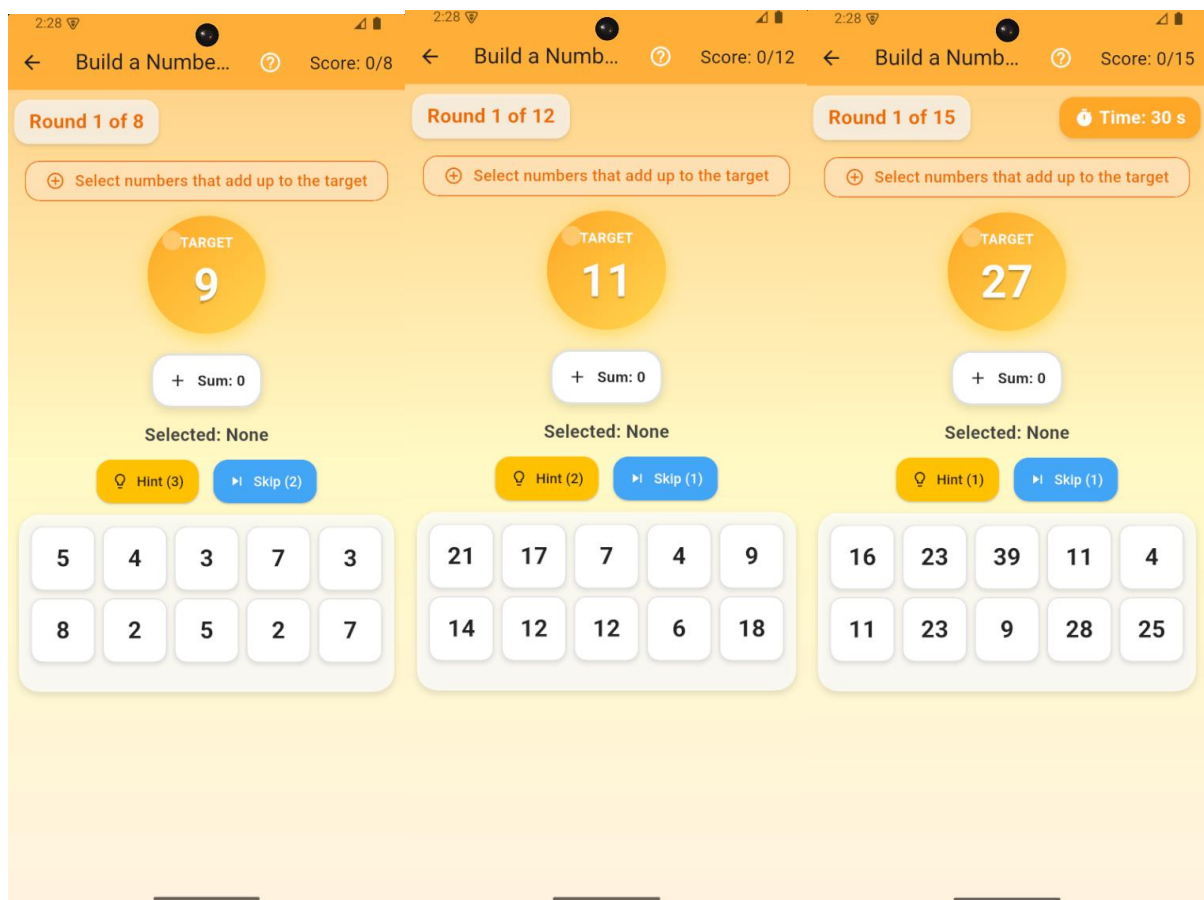
There is a question mark button at the top as a game instruction for every difficulty mode. The number range of questions is different and stated in the instructions. In addition, the balloon count is also different for every level. The player can see the number range first before answering the question based on their knowledge, especially for the kids.



Picture 1.5.5: Game Over Screen

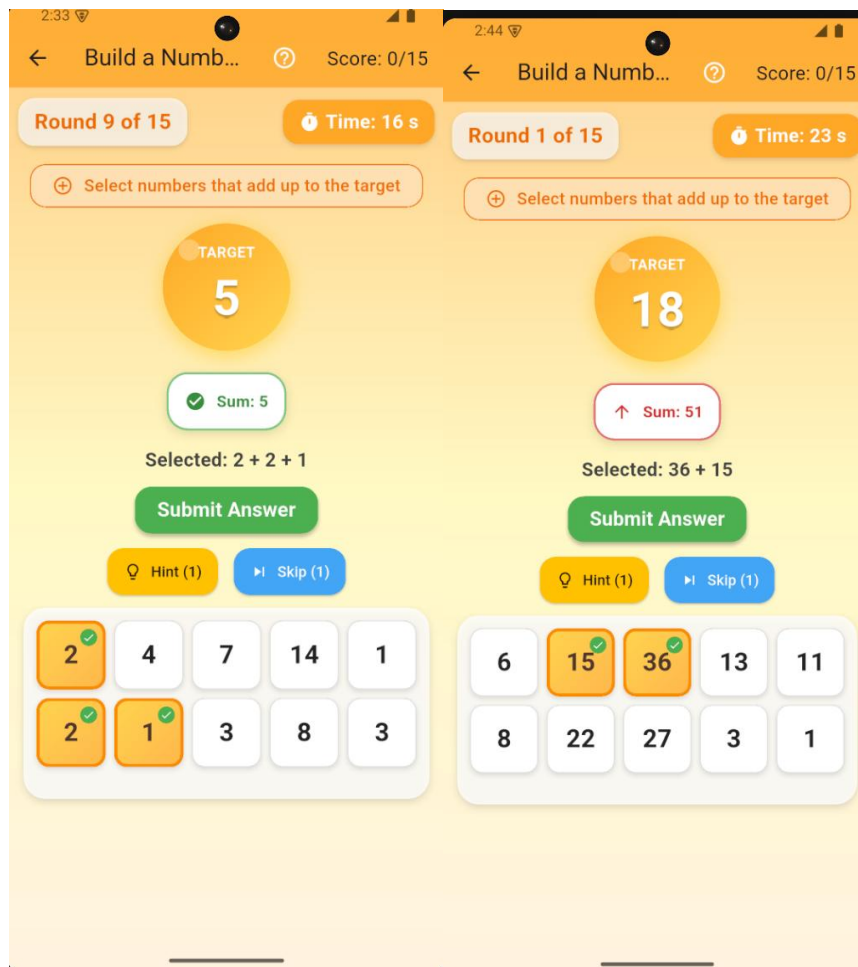
At the end of the game, a "Game Over" screen is displayed, featuring a congratulatory message, the player's final score, and options to restart the game or return to the home screen.

1.6 Number Composing Screen



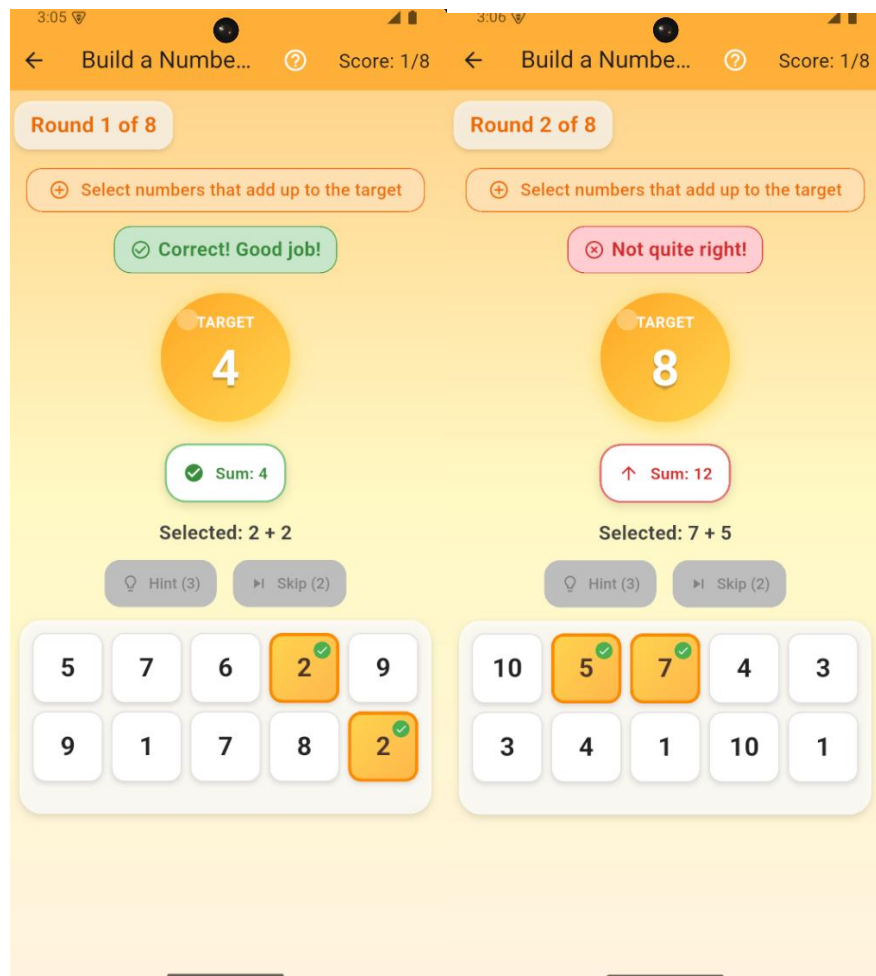
Picture 1.6.1: Number Composing Screen (Easy, Medium, Hard)

The Number Composing Game is designed to challenge players to select numbers that add up to a given target number. At the top of the screen, the current round and total rounds are displayed, along with a timer for hard mode. The target number is displayed in a circular container at the centre of the screen. Below the target number, players can see their selected numbers and the current sum of those numbers. The sum acts as a calculator to help the players to learn addition. A grid of number tiles is displayed, each representing a number that players can select. Players must choose two or more numbers from the grid that add up to the target number. Players can tap on a tile to select or deselect it, and the game dynamically updates the current sum as numbers are selected.



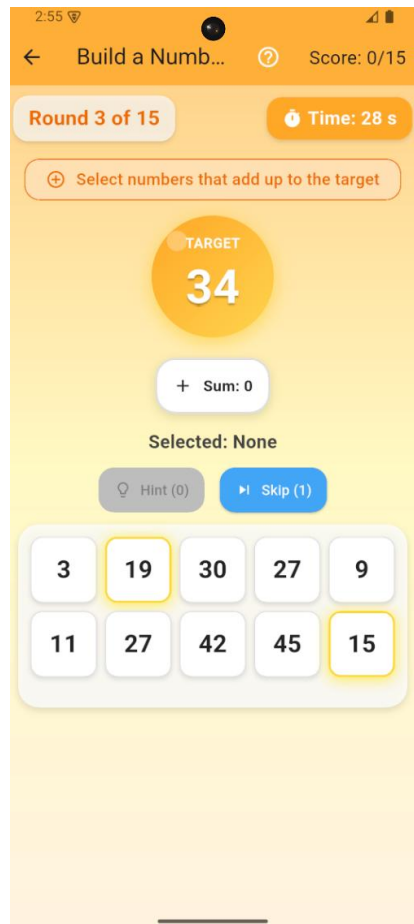
Picture 1.6.2: Numbers Selected Feedback

Players can tap on a tile to select or deselect it, and the game dynamically updates the current sum as numbers are selected. The “Sum:” will become green if the number is selected correctly and red colour if wrong. Therefore, the player can try and error to get the answer right except for the hard mode due to the timer. The “Submit Answer” button will only be displayed if two or more numbers are selected.



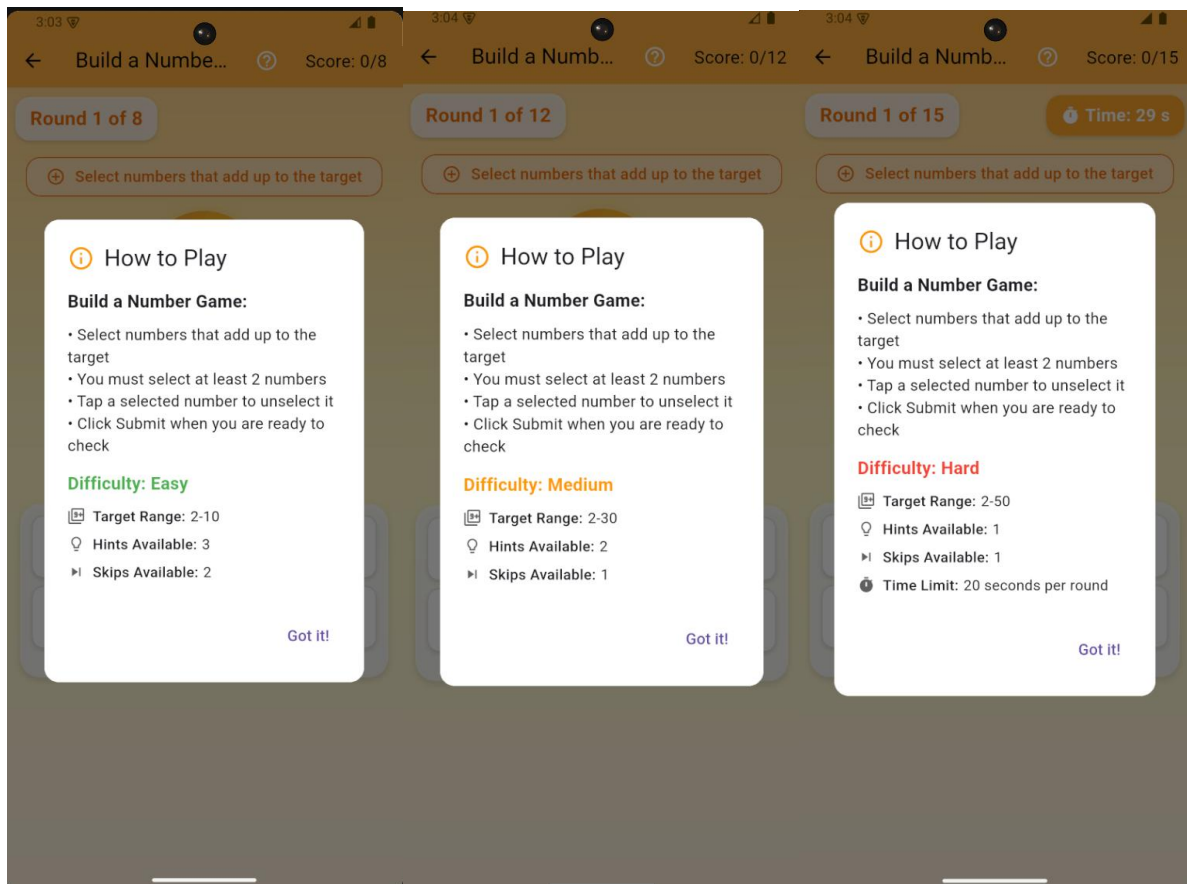
Picture 1.6.3: Answer Feedback

When a player selects a number, the screen provides immediate feedback through animations and sound effects to determine whether the answer is correct or incorrect. A transition animation then prepares the screen for the next round. For hard mode, a timer is displayed, counting down the seconds remaining for the current round. If the timer runs out, the game automatically registers the answer as incorrect and transitions to the next round.



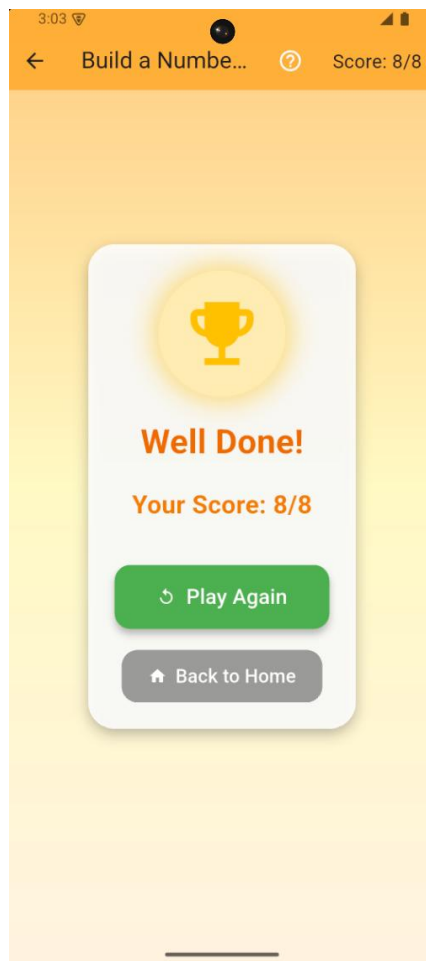
Picture 1.6.4: Hint

The game provides additional features such as hints and skips. Players can use hints to highlight numbers that contribute to the solution, and skips allow players to move to the next round if they find the current round too challenging. Both features are limited based on the difficulty level, and their availability is displayed on the screen.



Picture 1.6.5: Game Instructions

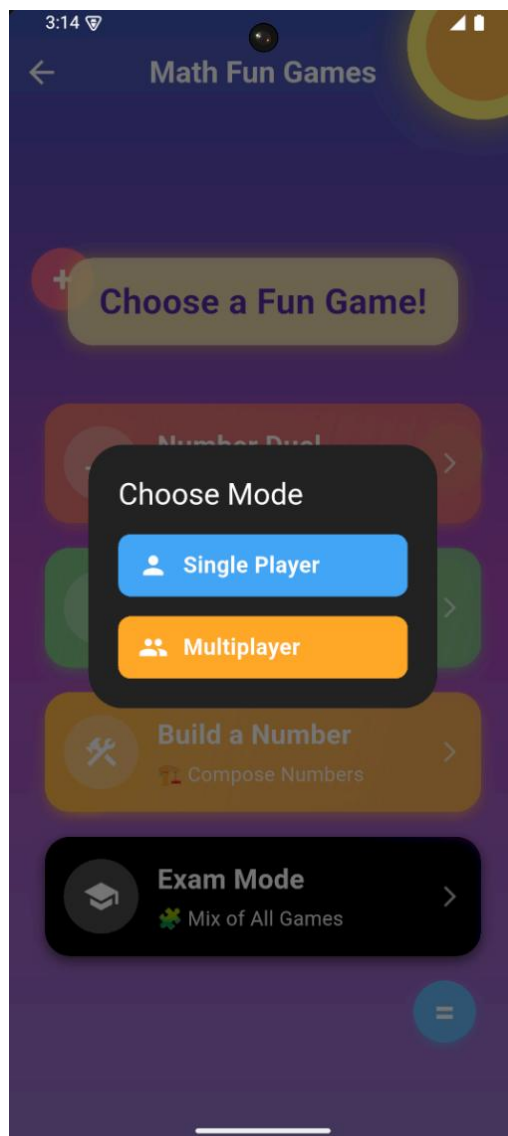
There is a question mark button at the top as a game instruction for every difficulty mode. The target range is different according to their difficulty mode. The game guide is stated inside to enhance user-friendliness.



Picture 1.6.6: Game Over Screen

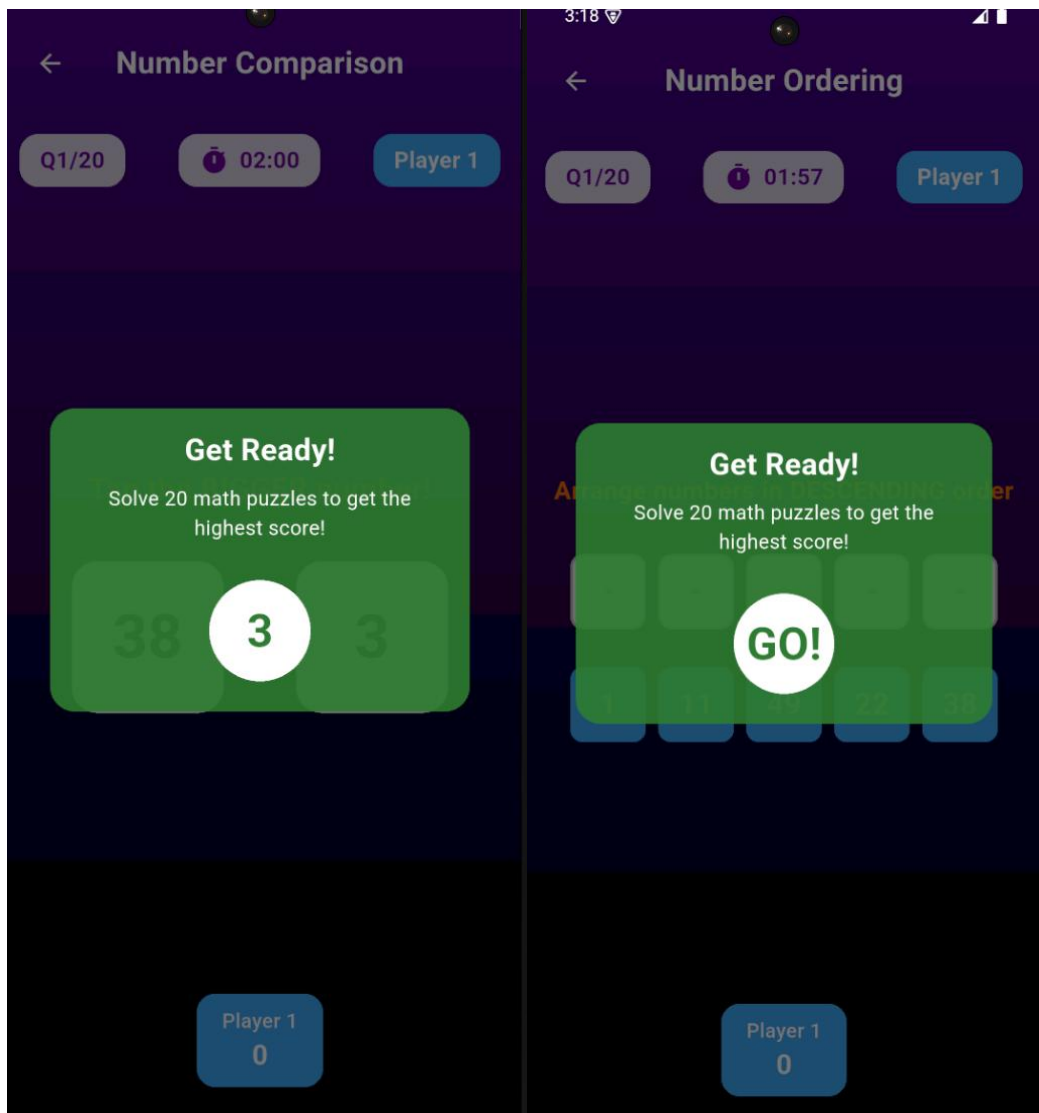
At the end of the game, a "Game Over" screen is displayed, featuring the player's final score, celebratory animations, and options to restart the game or return to the home screen.

1.7 Exam Mode Screen



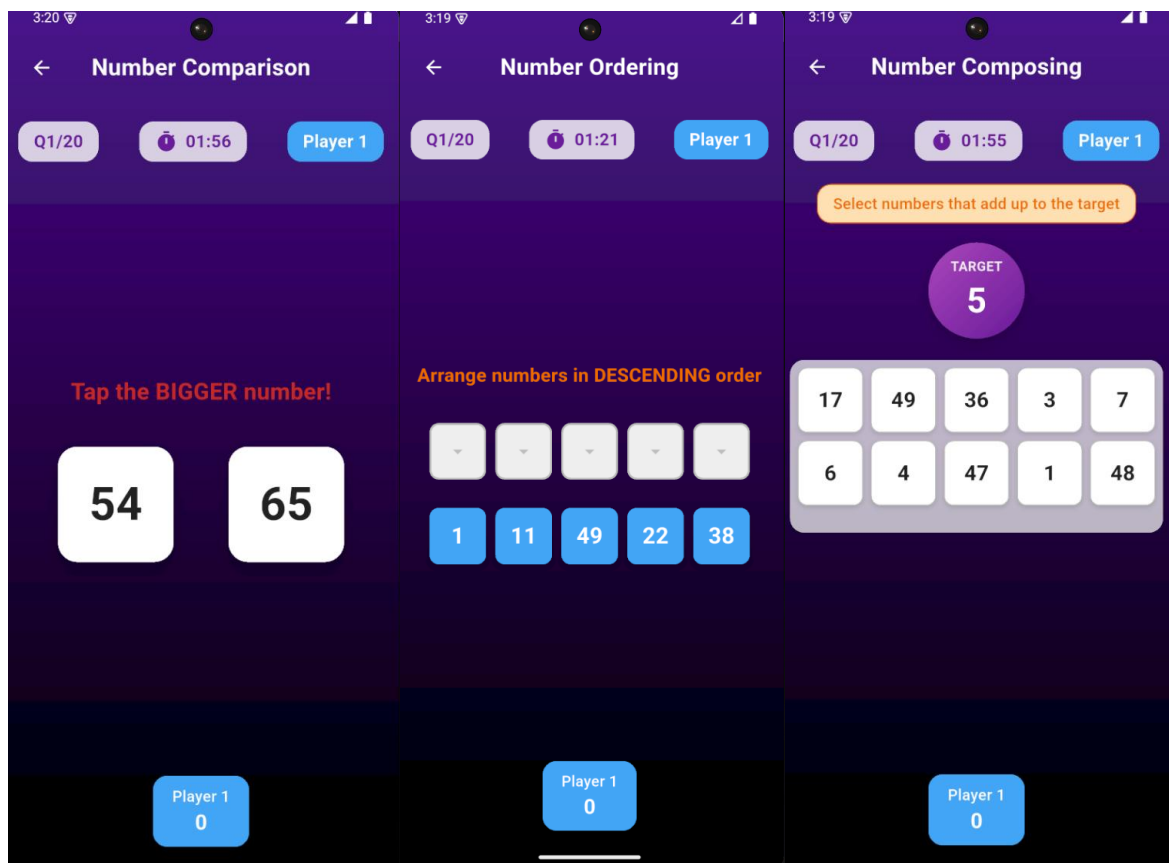
Picture 1.7.1: Choose Mode Screen

The Exam Mode Game is a comprehensive multi-game challenge that combines all three math games (Number Comparison, Number Ordering, and Number Composing) into a single, timed educational experience. It offers both single-player and multiplayer options, creating a competitive yet educational environment.



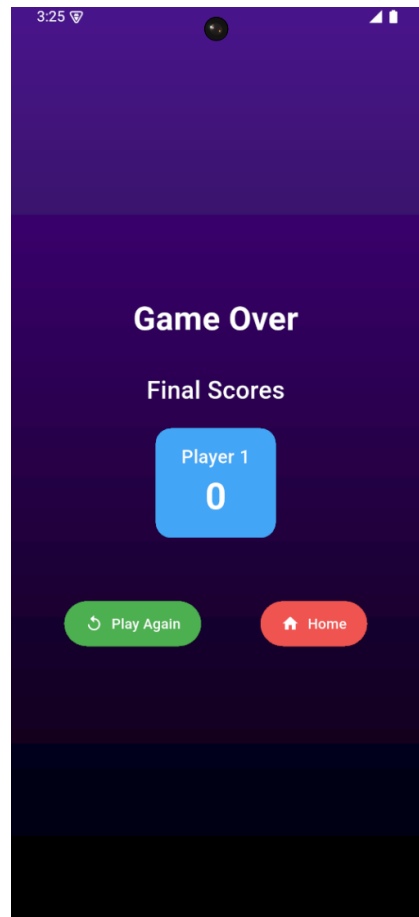
Picture 1.7.2: Single Player Mode Screen

For single-player mode, the game begins with an engaging countdown animation to build anticipation before the first question appears.



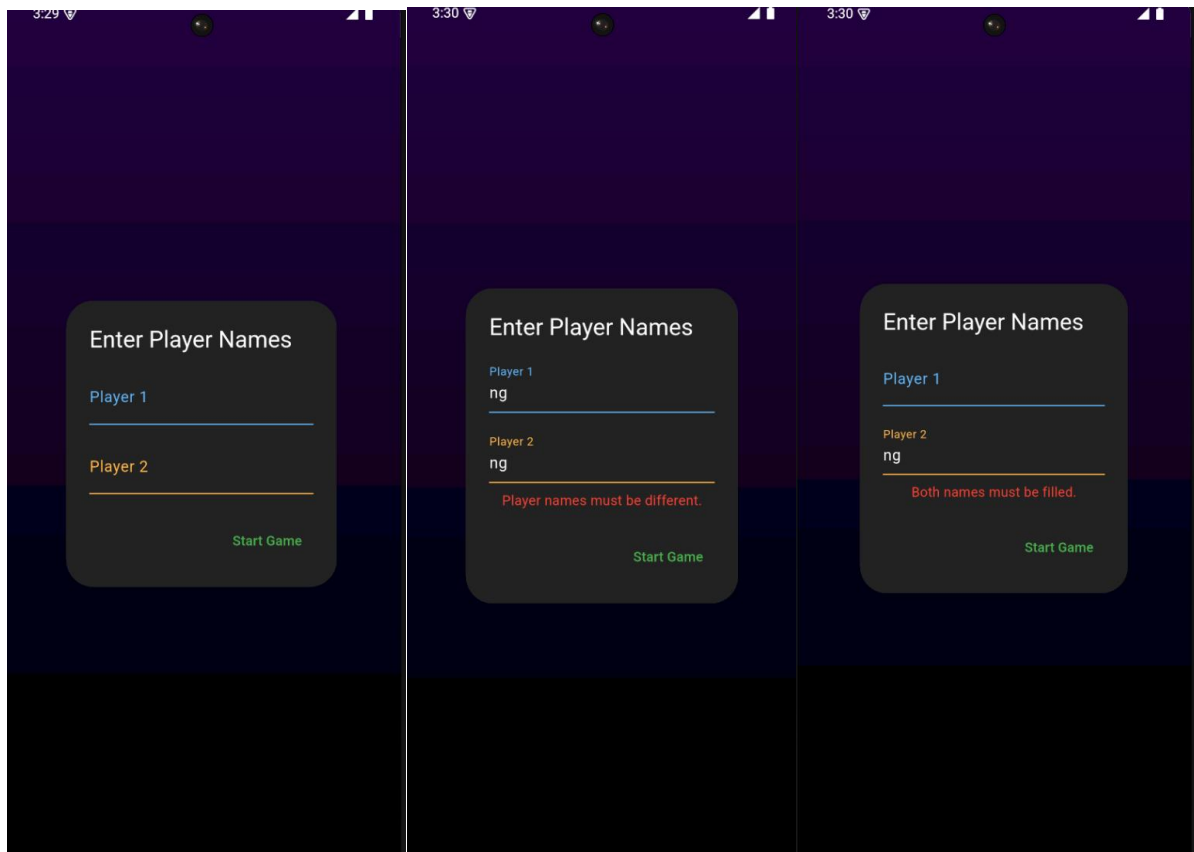
Picture 1.7.3: Combined Questions

In single-player mode, players face 20 randomly distributed questions across all three game types, with a 120-second time limit to complete all challenges. After each answer, immediate visual and audio feedback is provided, with a smooth transition to the next question. The scores will be recorded and awarded with 10 marks for one question correct.



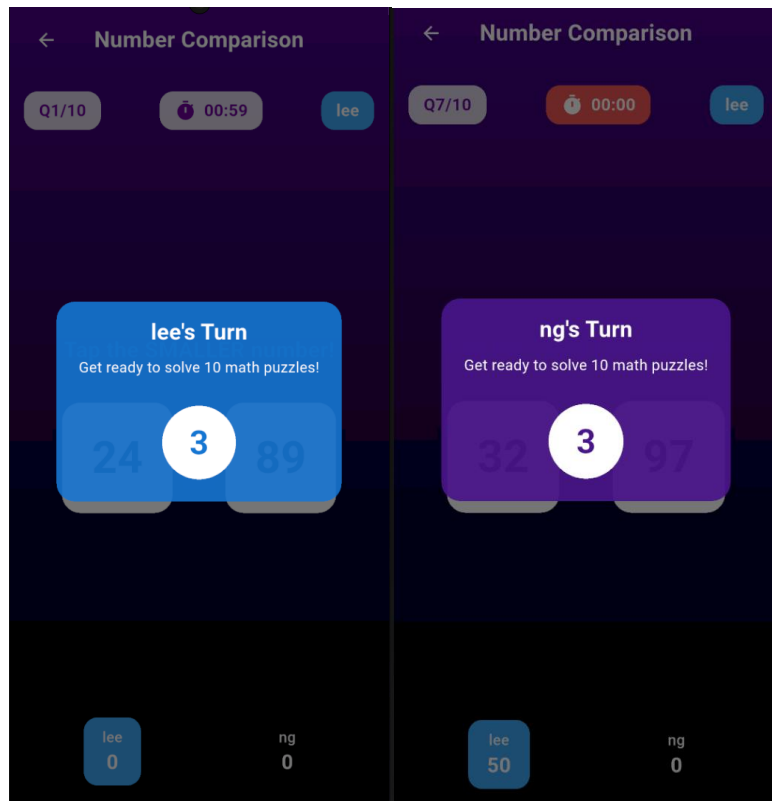
Picture 1.7.4: Game Over Screen

The final score will be displayed and also with the “Play Again” and “Home” buttons. The purpose of this single-player mode is to encourage players to improve their performance and aim for the highest possible score.



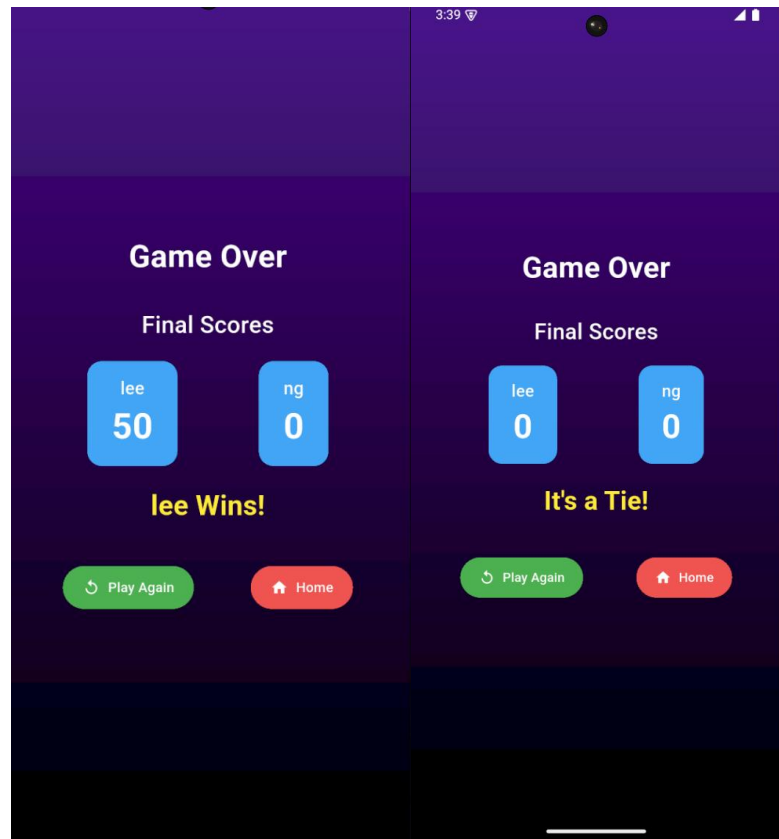
Picture 1.7.5: Multiplayer Mode Screen (Enter Player Names)

When Multiplayer Mode is selected from the Exam Mode menu, players are first prompted to enter their names through a dialogue box with clearly labelled input fields. The system performs validation to ensure both name fields are filled and that players have unique names. If validation fails (e.g., duplicate names), an appropriate error message is displayed.



Picture 1.7.6: Countdown Notification (Player 1 & Player 2)

The Multiplayer Mode in the Exam Mode Game offers an engaging competitive experience where two players take turns solving various math challenges. This mode transforms the educational experience into a social activity, allowing friends, siblings, parents and children to compete while developing math skills. Once names are confirmed, the first player's session begins with a countdown screen. This builds anticipation and clearly signals whose turn it is. The game ensures balance by distributing an equal number of each question type (approximately 3 of each plus 1 random) to each player. The first player then faces 10 randomly distributed questions across three game types. Each player has 60 seconds to complete all 10 questions, with a timer displayed at the top of the screen. The timer changes to red when 30 seconds or less remain. The current player's name is highlighted in their designated color (blue for Player 1, orange for Player 2), making it clear whose turn it is throughout the game. When the first player completes their 10 questions or runs out of time, a transition screen appears announcing "[Player 2's Name]'s Turn" with another 3-2-1-GO! countdown. This clear transition prevents confusion about whose turn it is.



Picture 1.7.7: Game Over Screen

When both players have completed their turns, a "Game Over" screen displays both players' final scores and announces a winner or declares a tie. Players can choose to play again (which resets the scores and generates new questions) or return to the home screen.

Section 2: Conclusion

The Math Fun Games application is an educational platform that offers an engaging approach to mathematics learning through gamification. The codebase follows a clean architecture pattern with a clear separation of concerns across models, screens, widgets, and utility folders. At its core, the application leverages Flutter's reactive programming paradigm through ChangeNotifier and Provider patterns to manage state efficiently across multiple game modes. The SoundManager implementation demonstrates sophisticated audio handling with background music, sound effects, and proper resource management that prevents memory leaks. The application has four different game modes with three difficulty levels: Number Comparison challenges players to identify larger or smaller numbers; Number Ordering requires arranging sequences in ascending or descending order; Number Composing tests addition skills by selecting numbers that sum to a target value; and Exam Mode combines all three into a comprehensive assessment with both single-player and multiplayer options. Each game implements difficulty-specific parameters that adjust number ranges, time limits, and available hints. The UI design incorporates animations throughout, including button effects, feedback indicators, and decorative elements that create a visually appealing experience for children. Timer management is handled carefully to prevent setState() after dispose() errors, with proper cleanup mechanisms in place. The multiplayer implementation in Exam Mode provides a competitive experience with balanced question distribution and clear player transitions. The error handling, employing nullable types properly and implementing fallback mechanisms for unexpected states are coded well. Finally, this mobile application works perfectly and can be played and downloaded from [GitHub link](#).

Section 3: Appendix

<https://drive.google.com/drive/folders/1vt1HY30IQwI81V7xJamZSPFyFbJLEZTS?usp=sharing>

<https://github.com/NgWY02/UCCD3223-Maths-Mobile-App-for-Kids>