

Aerial Areas

Software Engineering COMP 4110
University of Massachusetts Lowell
Fall 2025

Team members:

Game Developer/Project Manager: Benjamin Brookhart

Game Developer/Document Manager: Bennett Porter

Game Developer/Creative Lead: Thomas Fitzpatrick

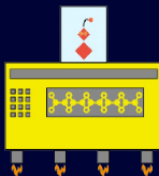
Game Developer/Website Developer: Omar Aly

Game Developer/Graphic Developer: Nathan Prentiss

Instructor: Dr. James Daly

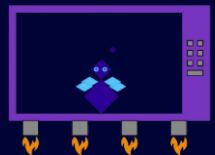
Project Overview

- Aerial Areas is a Shoot 'em up math game to practice area, perimeter, and circumference formulas to students in the 4th-7th grade.
- The game has 12 waves where they have to solve problems to defeat the enemies or bosses in each wave.
- The shapes used in this game are rectangles, triangles, and full, half, and quarter circles.



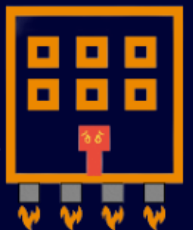
Overview of Features

- Aliens called "Geometroids" descend onto Earth, they can be defeated when the player answers their geometry problems.
 - Swarms of Geometroids or Boss Geometroids can be encountered
- Buy upgrades and powerups
 - Upgrades: Bigger Booms, Slower Enemies, Max Lives
 - Powerups: Fireball, Freeze, Frenzy
- Multiple Difficulties
 - Easy, Medium, Hard, Nightmare
- View High Scores



Domain Research

- Consulted the Massachusetts Mathematics Curriculum Framework to ensure the concepts used were known yet still challenging.
- Researched and play tested similar educational games to decide how to best balance learning and fun.
- Looked into similar shoot 'em up games to see examples of the gameplay loop and balancing.



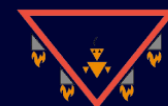
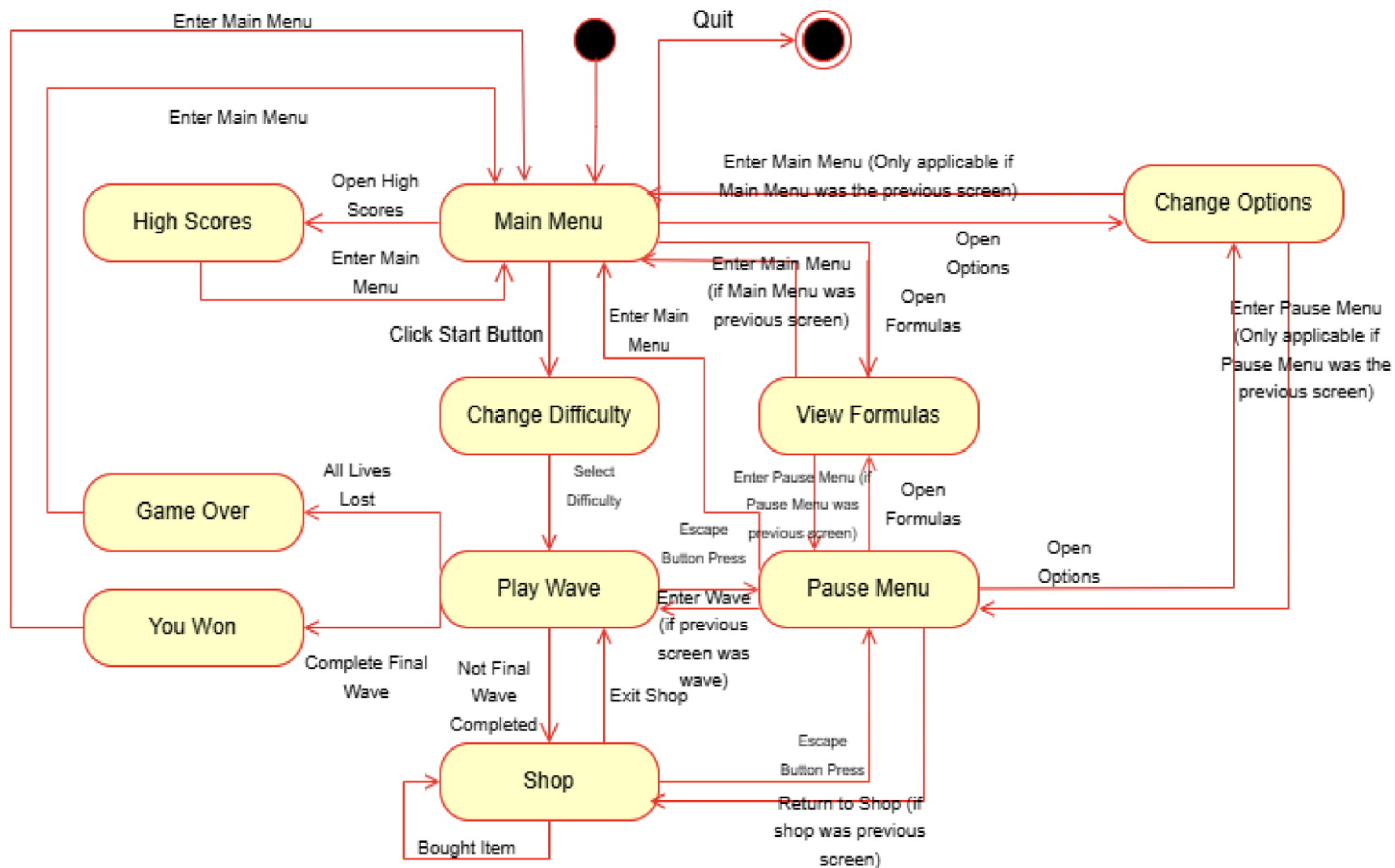
Constraints

- Design the game to be engaging and fun while also reinforcing learning.
- Make sure the game is simple to understand and the design can be implemented in the given time.
- Use Godot and C Sharp to implement the project

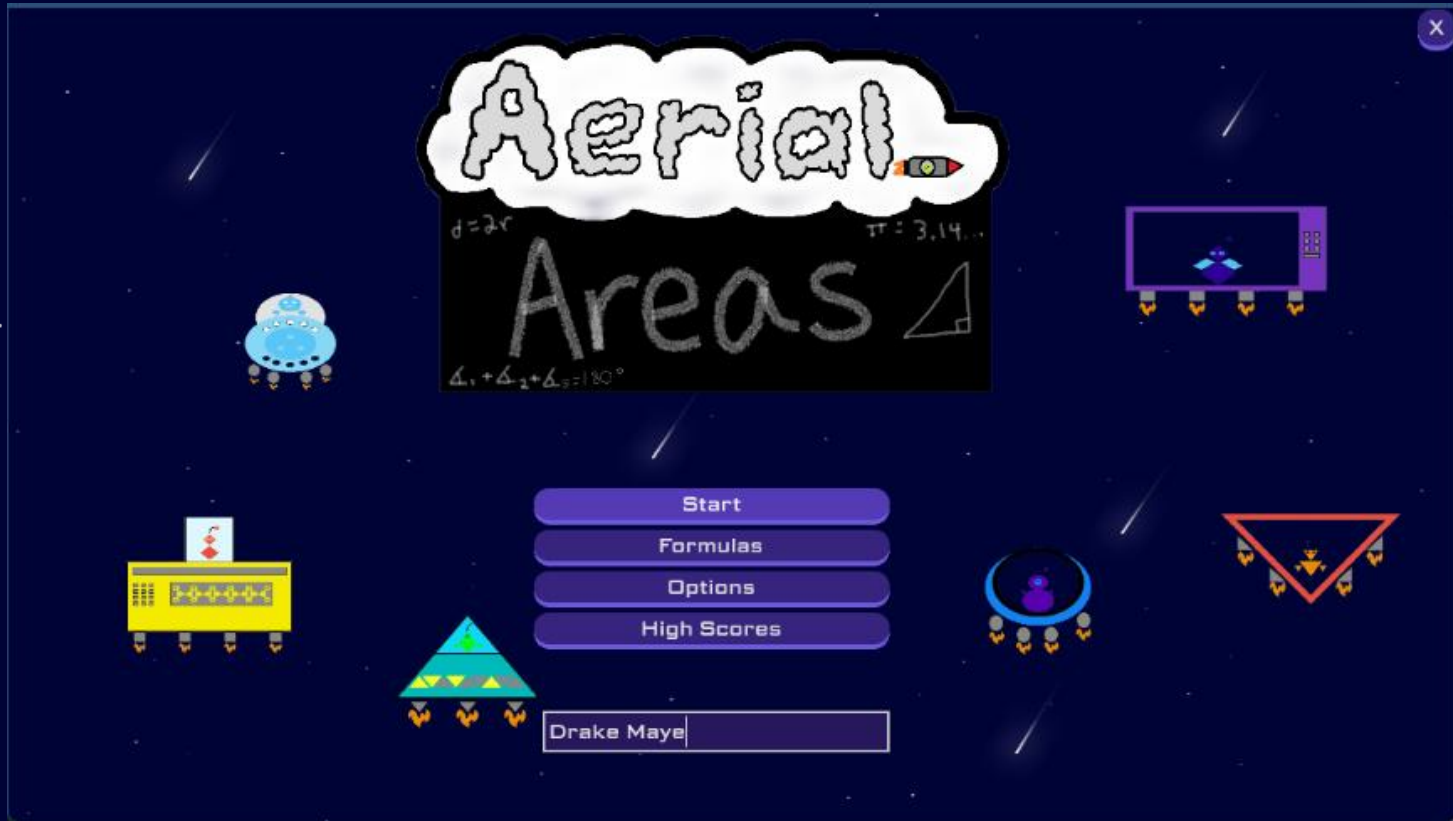


State Diagram





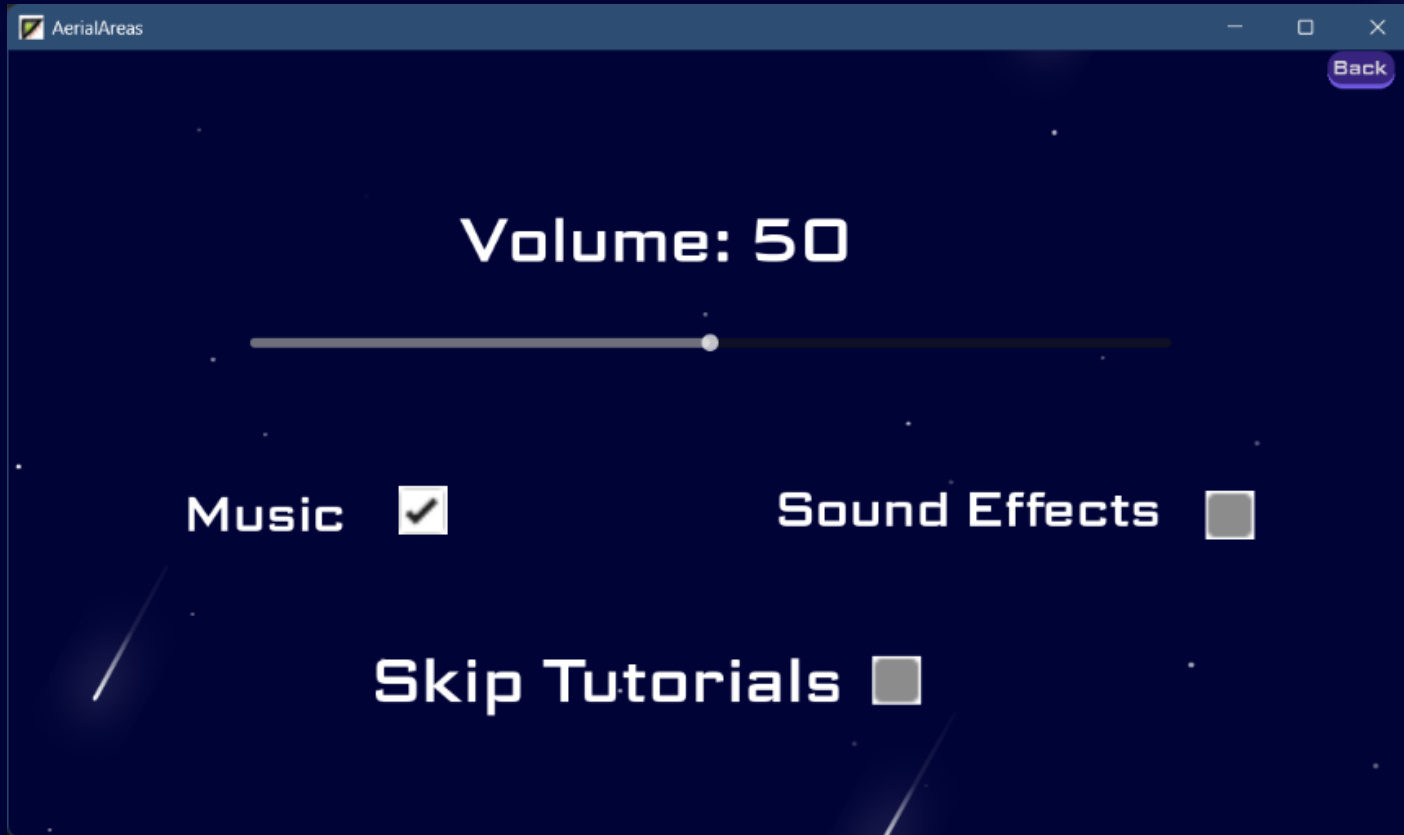
Demo Part I Main Menu



- Type name in textbox
- Able to view formulas, options, and high scores
- Start lets you choose easy, medium, hard, or nightmare difficulty



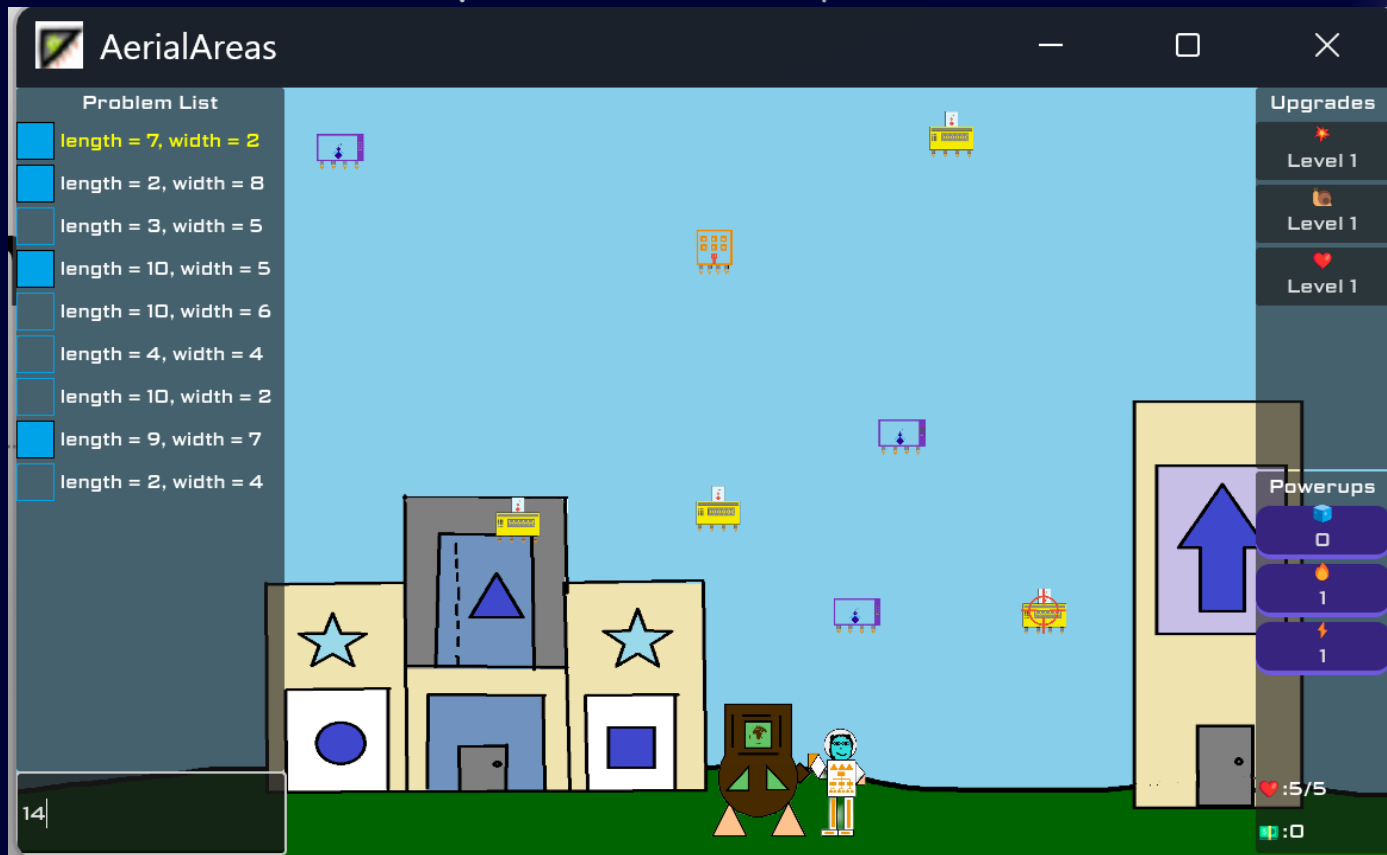
Demo Part II Options



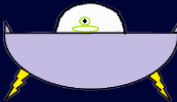
- Able to toggle music, sound effects, and tutorials, and change volume.
- Keeps the settings when game is reopened.



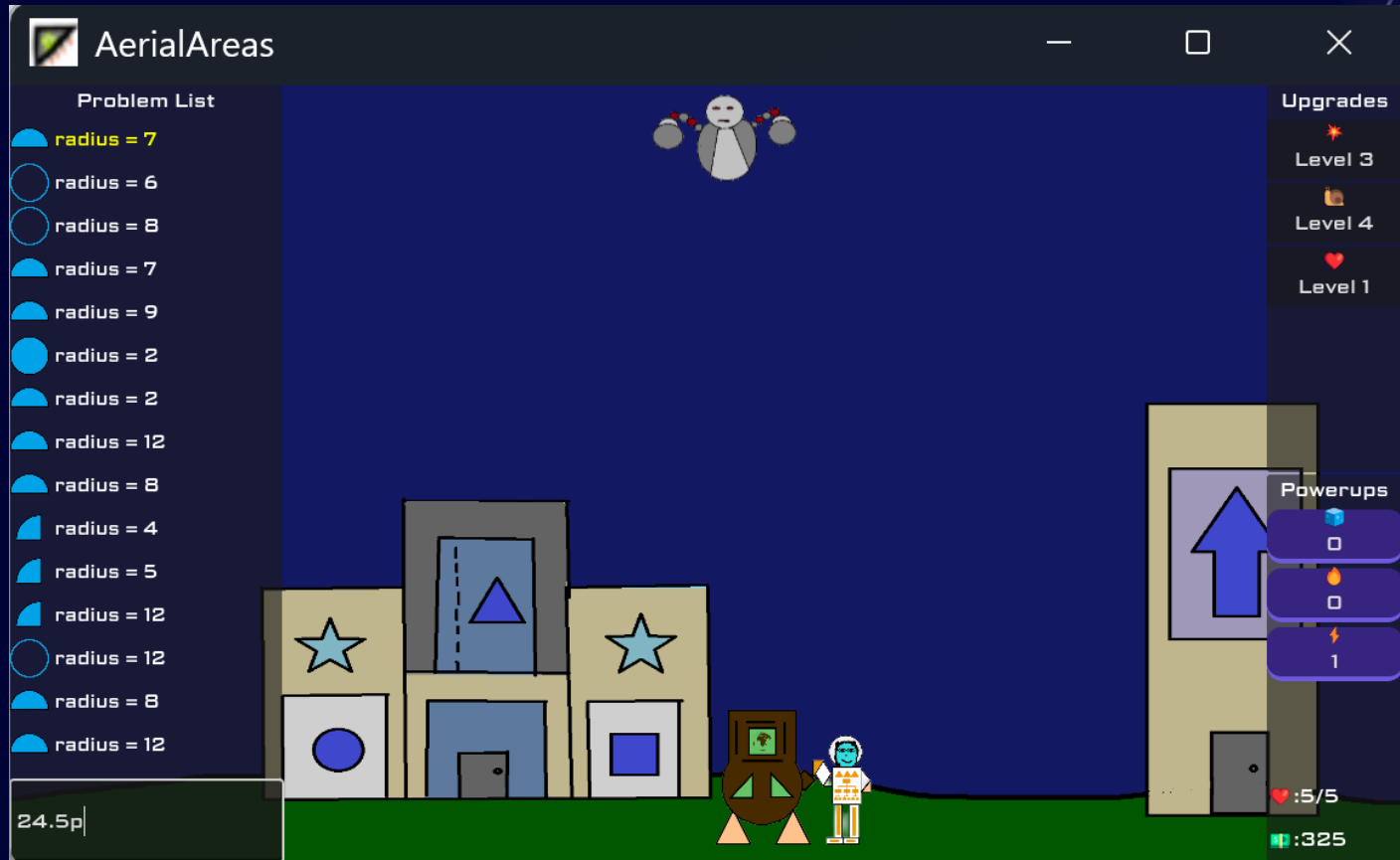
Demo Part III Normal Wave



- This screenshot shows a daytime wave with normal enemies.
- The player is entering solution '14' for the highlighted area problem.



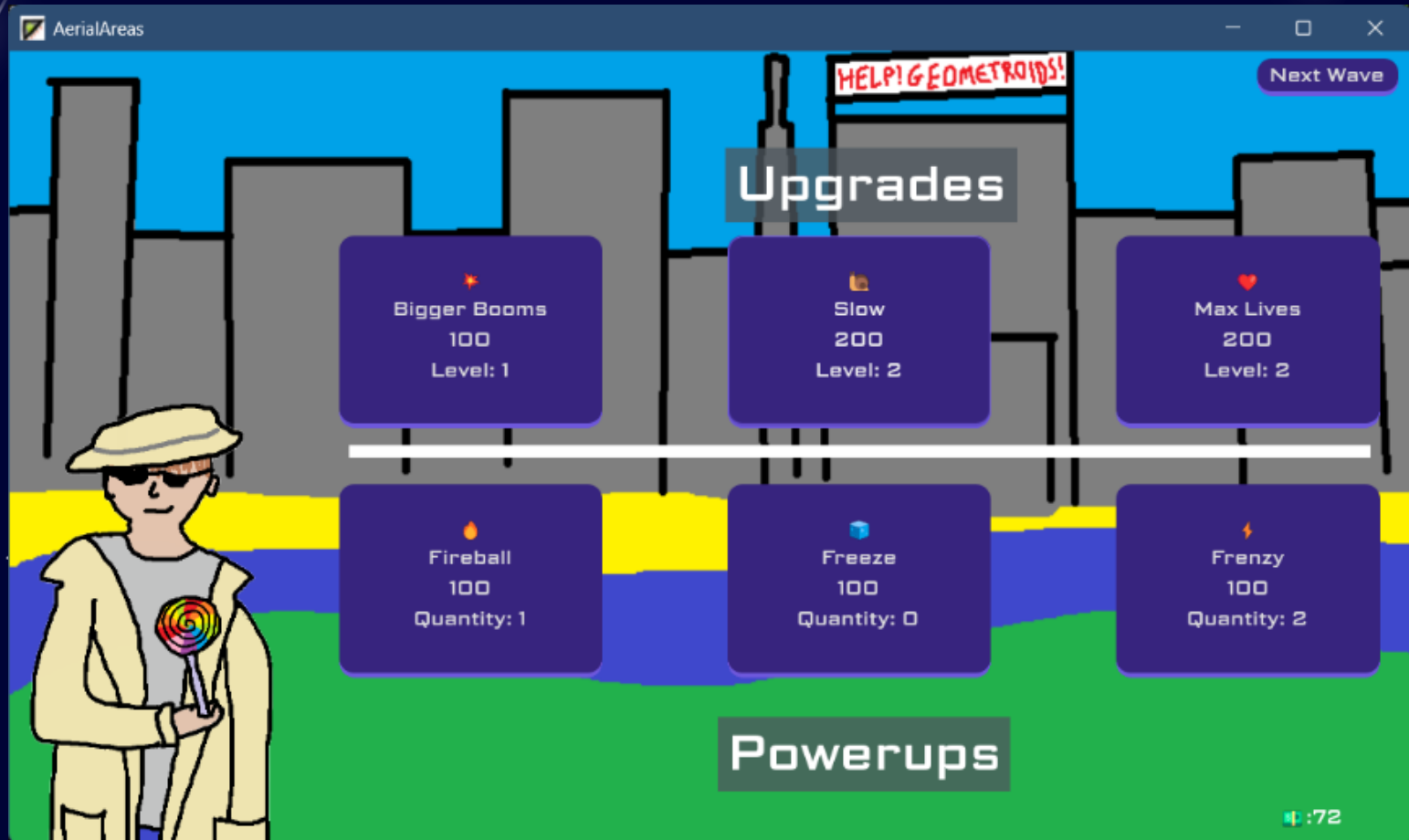
Demo Part IV Boss Wave



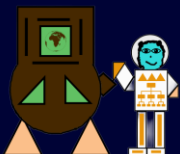
- This screenshot shows a nighttime wave with a boss enemy (made up of normal enemies).
- The player is entering solution '24.5p' or 24.5π for the highlighted problem.



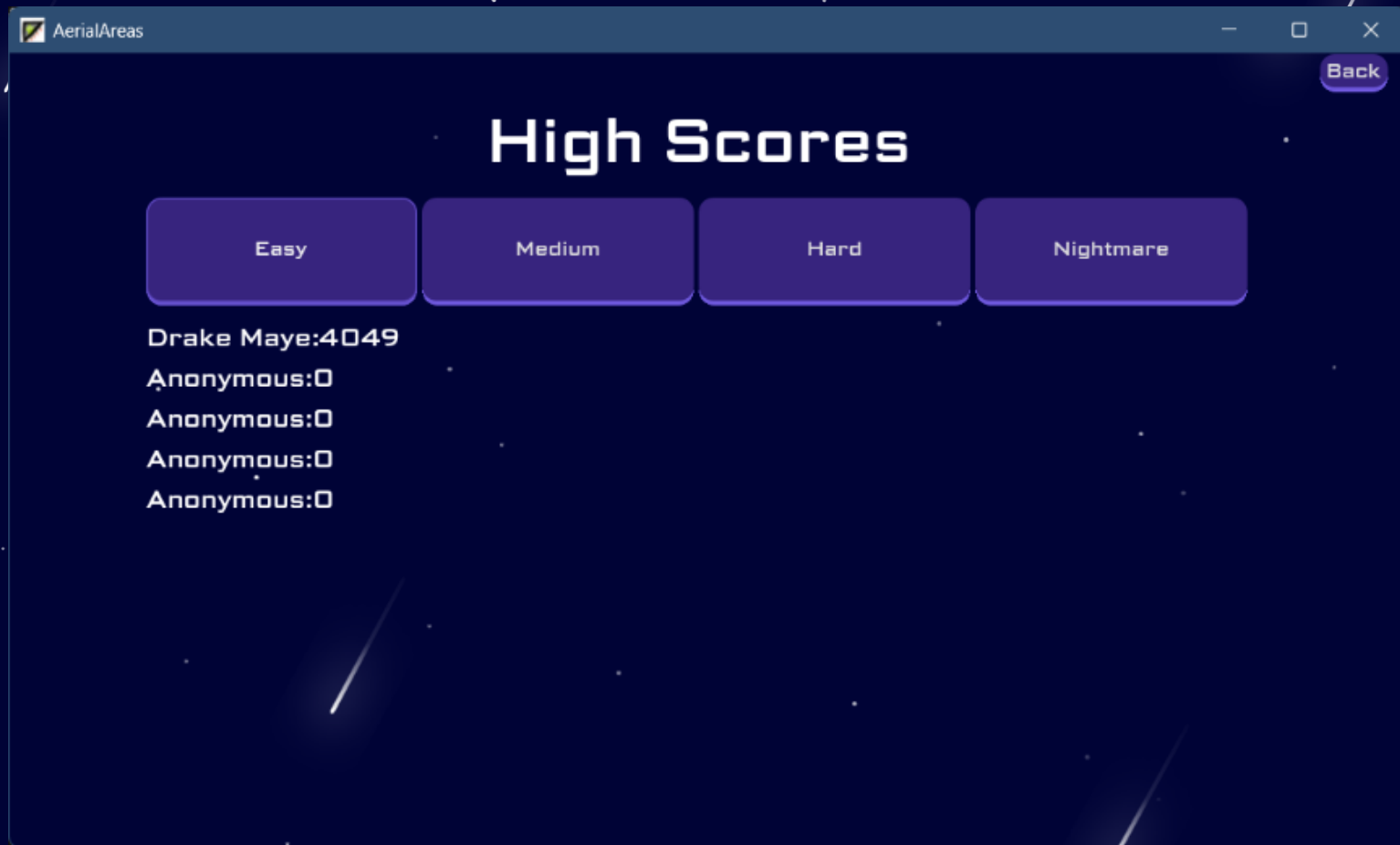
Demo Part V Shop



- Buy upgrades and powerups from The Shop™
- Goes to the next wave when player is all set.



Demo Part VI High Scores



- Saves high scores after end of a game.
- Shows five of the highest score of each difficulty



Improvements

- Allow input handling for fractions
- Add animations to enemies
- Add dynamic sprites to bosses
- Add more powerups and upgrades
- Changed tutorial to be more hands-on



Future Features

- Administrator settings for problems so teachers can choose which problems the students have to solve
- Short cutscene at start and end of game to add a narrative
- Achievements and stats page
- Score bonuses for certain accomplishments



Thanks For Listening

- Any Questions?

