

# Project Name

Execute Operator Execute

## Project Members and their anticipated roles

Joshua Villanueva - everything

## Brief Game Summary + Software

My idea is a 2D pixel art, deck-building, roguelike game with turn-based combat similar to Slay The Spire. Essentially, in a full game, there will be 3 zones each with around 10 levels. Each level will have a random monster or an event that players will use math operations to do battle/interact with. If you can make it to the end zone and beat the boss, you can win. However, the monsters and enemies will get more and more difficult as the area progresses. This game will be built primarily using Unity and any copyright-free music/assets may be used for the sake of this course deadline. If time allows, assets and music may be created with Aseprite and MuseScore, respectively.

The primary mechanic of the game is how battles between the monsters and the player work. To start each battle, players will be given a hand of 5 cards, and both their and their opponents health will be displayed. The cards will revolve around the operations and have values attached to them. Above each participant, a number will be displayed, at the start of the round, it will be set to 1, this is known as their personal number. At the start of each turn, a random number will be displayed in the middle top of the screen, this will be identified as the goal number. Each round, the player is meant to use their cards, which will apply their listed operations to their own personal number, to try to get a value as close to the EXACT number as the goal number as possible. However, they may not be able to based on their cards and being lower or higher than the goal is equally as detrimental. They can play up to their 5 cards, and they will draw a new 5 every round. The monsters will also display a random operation they will be using, similar to the player's cards, and every card the player plays allows the monsters to use another action as well, meaning each card comes at the cost of letting the monster move as well. After the player chooses to end the round, whoever's personal number is closer to the goal number will win the round, and the loser will take damage equivalent to the disparity between their personal and the goal number. Example: Goal: 5, Enemy Personal: 6, Player Personal: 2, Enemy wins, player takes  $(5-2) = 3$  damage. Same thing will apply if the player had 8.  $(8-5) = 3$  damage. If both player and monster reaches the exact number, no damage is taken by either, however if they both have an equivalent disparity to the goal number, they will both take equal damage. If one party's personal number is exactly the goal, and the other does not meet it, they will take full damage equal to the goal number.

As stated before, most cards will have operations attached to them, however there will be some that have other effects to add variety. The other most notable archetype will be the disruption cards. Similar to the normal cards, they will have operations attached to them that will affect personal numbers. However, instead of changing the user's personal number, it will be a targetable attack that can be used to change any other entities' personal number. These will be available to both monsters and players during the rounds. Additionally, players may get cards that have none number altering abilities such as card draw, hp restore, etc.

After the core battle mechanic is looped until enemies are defeated, the player will have a reward that lets them build their deck with new cards or altering numbers on the cards. The random events mentioned before will be one-of instances where the player will be given a scenario, and then they must choose the correct card to get a correct mathematical outcome, then it will give the player a reward, typically a relic, which is not part of their card deck instead will offer other boons in the run such as card draw, damage reduction, etc. And then it will keep going until the end of the available levels or the player's defeat. Enemies will be given thematics that grow increasingly more specialized as difficulty increases, some enemies may play more cards that mess up your operations, some may start to deal with negatives, etc.

The game is meant to show your personal number as well as the enemies as it progresses so that it's enough work to keep track of it, but I am currently debating whether or not it should be a mental math sort of approach where the final calculation is only shown at the end. The approach I'll probably use is that the personal number shows calculations only after the card is played, but if you turn on a challenge mode it won't update until the entire round is over.

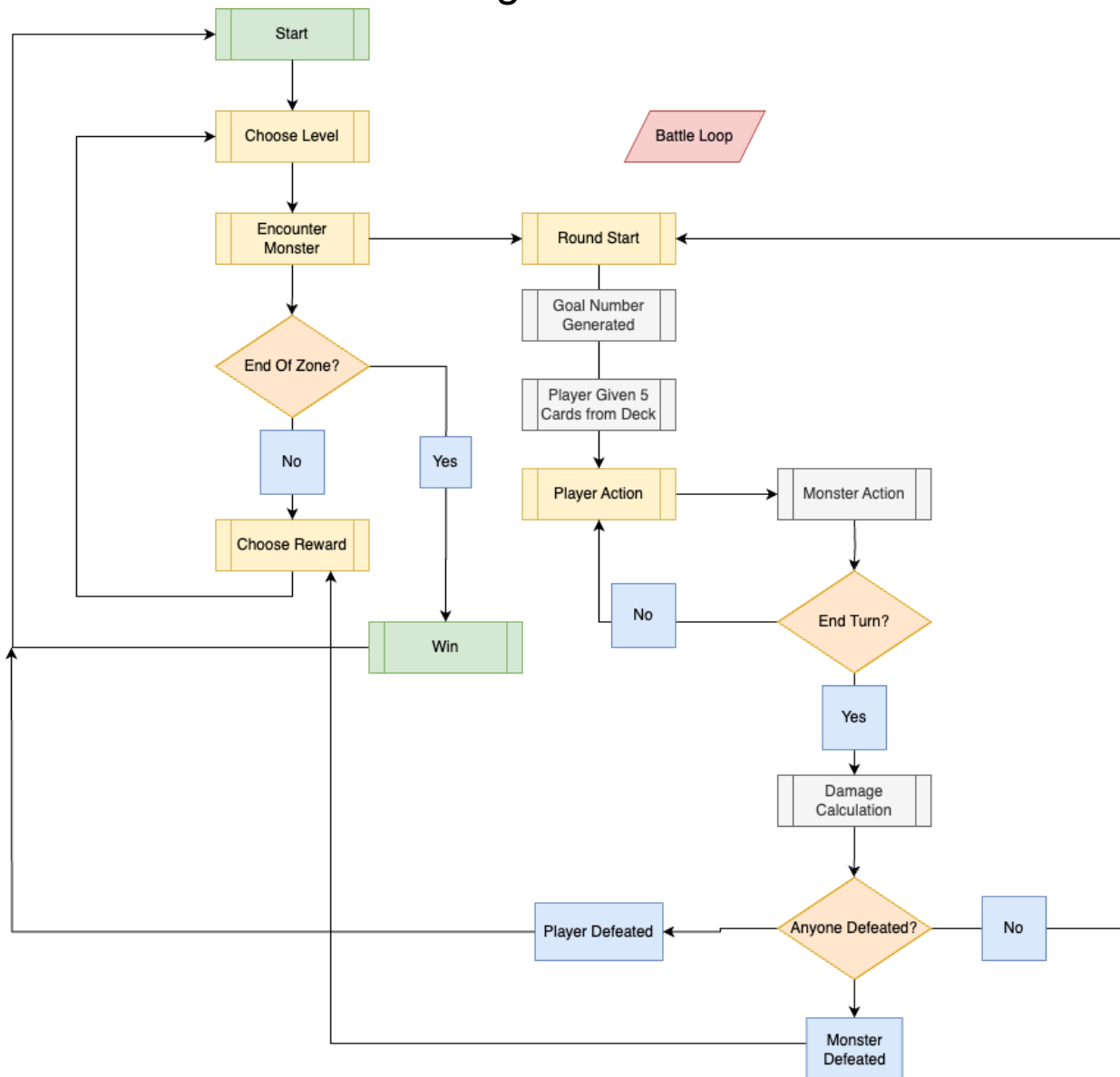
This game is meant to give students a space to practice math skills rather than learn them from scratch. I will have a brief introduction and short tutorial on the basis of each skill when they are introduced, but it will not be a full breakdown. I will also try to implement a book that has each operation and description that students will be able to refer back to. I want to make the game slightly more challenging, with an intended audience of high school students and up, which will be highlighted more below. As such, I want it to start with four basic skills in the first zone: addition and subtraction, then multiplication and division, using single digits, then working up to double digits. After that zone, it introduces powers, squares, negatives, and absolute values. Slowly but surely it'll get to using operations on large numbers, maybe up to 4 digits, or using more advanced math, such as derivatives.

## Learning Outcomes

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- Students will be able to create equations from randomized math operations in order to reach a desired output
- Students will be able to apply math operations to alter their personal number to reach the goal number
- Students will be able to analyze how different operations in their hand can work together to alter their personal number

## Game Mechanic Flow Diagram



## Anticipated Problems

1. Large scope for timeline
  - a. Will need to prioritize core mechanics over embellishments
2. Implementing the higher level math concepts may be hard

3. Could be over indexing into the “fun” focus, need to be sure that the educational part is sufficient
4. Creating the enemy functions
  - a. Implementing AI to fit the turn-based modality, especially flipping between player and enemy actions
  - b. Determining the set of actions they are allowed to take,
5. Implementing core gameplay parts
  - a. I’ve never created a turn-based system before
  - b. Nor have I created a card based one either