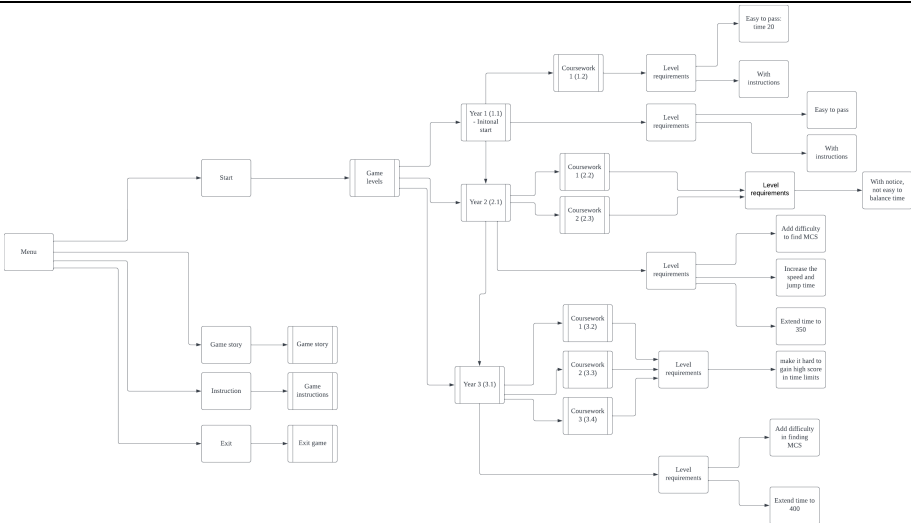
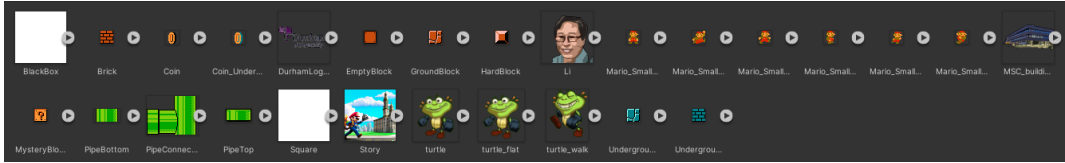
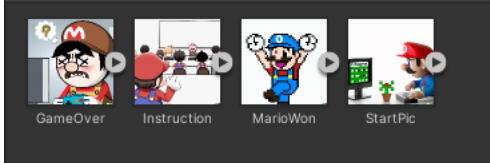



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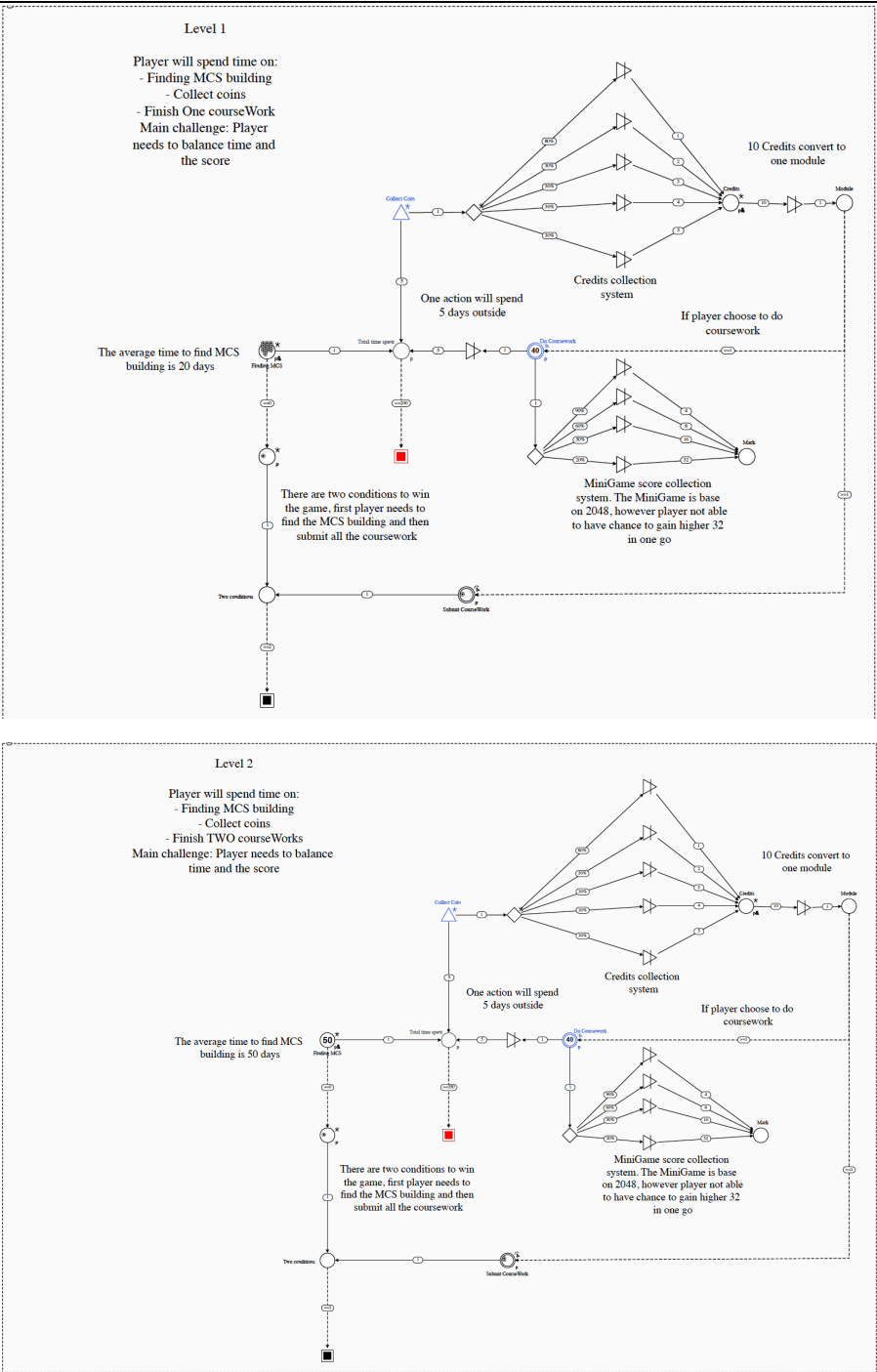
Student Name / ID: Zhenhao Zhao/000884301

Game Title: Mario's Study Adventure: A Journey through Durham University MCS

Marking Criteria	Describe how your game matches the criteria (Description of each item is limited to 50 words)
Game title, game genre and story (5%)	
Game title and game genre:	Game title: Mario's Study Adventure: A Journey through Durham University MCS Game Genre: <u>2D platform, Strategy, Puzzle, Simulation</u>
Game story and how the game genre choice matches with your game story:	Mario enrolls at Durham University to study computer science. He needs to get credits, finish coursework, and find MCS building in a limited time while facing challenges from Bowser's "Lazy factors". With help from Frederick Li, he strives to earn his degree. Will he succeed? Time will tell. The game <u>simulates</u> the study life of a CS student with strategy and <u>time management</u> elements. It has <u>puzzle</u> mini-games based on <u>2048</u> and is a <u>2D platformer</u> inspired by the <u>Mario series</u> .
Core development and implementation (15%)	
Game scene (visual representation [2D, 2.5D or 3D], internal data structure):	This is a <u>2D platformer</u> video game. We use a <u>simple key-value pair storage system</u> as part of the internal data structure to store player playing history to enable player can jump from different scenes; it provides a straightforward way to store and retrieve data in the game.
Game flow and how it is designed (e.g., scene navigation, level design):	<p>*Level progression design</p> <p>*Each level design requirements (with scene match):</p>

	<div></div> <p>The game consists of three levels (years) and six mini-games (coursework). To unlock the next coursework, the player must collect 10 credits and complete the previous coursework. The game design follows the "Kishōtenketsu" philosophy used in the Mario series, where the game starts off easy and gradually becomes more challenging to allow the player to become familiar with the game and feel challenged but also enjoy the fun of the game.</p>
<p>Game object (e.g., use of sprite, 3D objects, simple object movement and animation):</p>	<p>Sprites include different types of blocks to build level environments, 2D characters (Mario and enemies), movement and animations (running, jumping, and pipe entering), a pixel version of Frederick Li, background, and sound effects (jumping, coin collecting).</p> <p>MainGame:</p> <div></div> <p>Others:</p> <div></div> <p>Music:</p> <div></div>
<p>Game mechanics with machinations diagrams (30%)</p>	

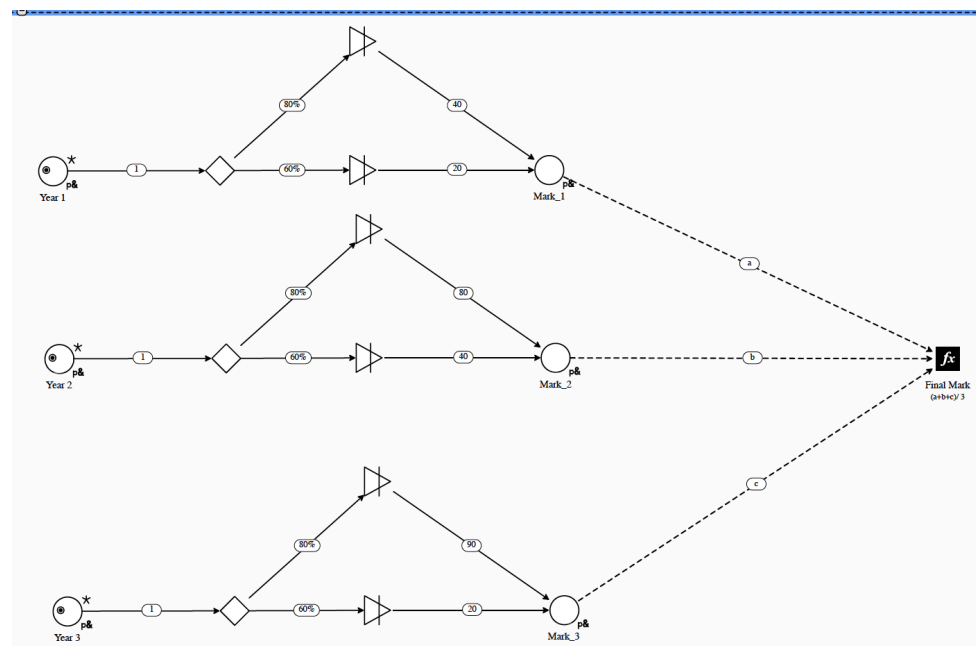
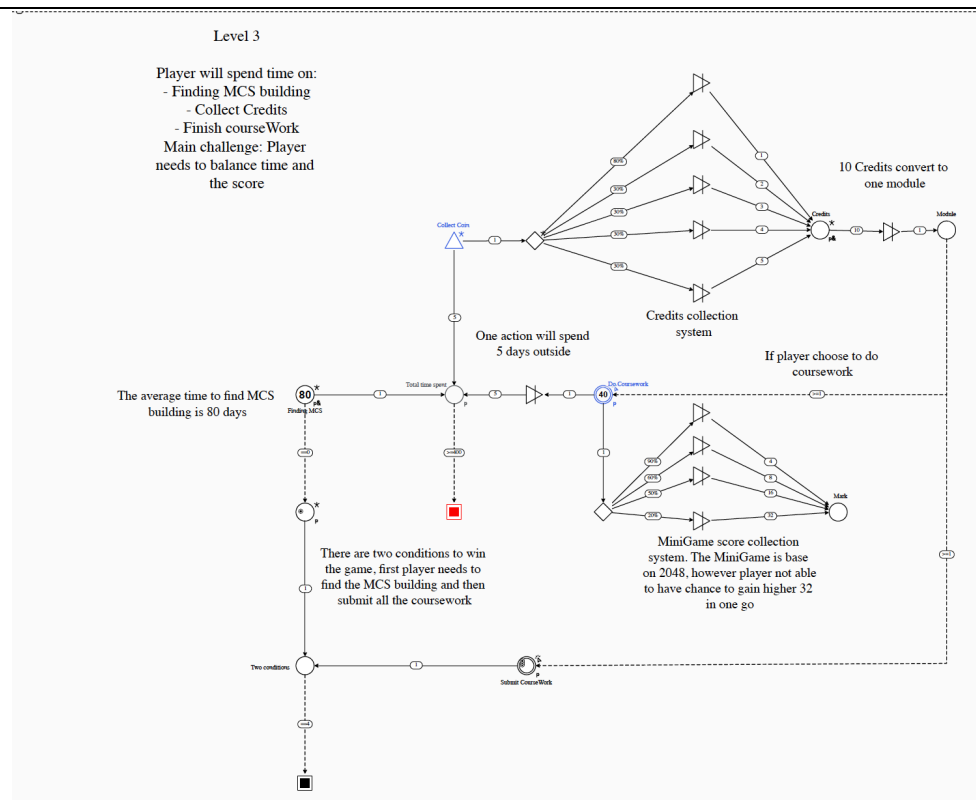
Main game rules / logics to control game progression, difficulty and end game conditions:



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	<div>Game economy</div> <div>Credits-Module: 10 Credits get one module</div> <div>Gain Credits:</div> <div>Time: Player would spend average 5 days to have a chance to get credits.</div> <div>Value of credits: Player has high chance to get 0 or 1 credit, and has low chance to gain 2-5 credits in one go.</div> <div>Time</div> <div>Major Game's 5 days is mini Game's 1 day. Major Game's 1 day is real life's 1 second Mini Game's 1 day is player's one action.</div>
	<div>(*All images can be found at end of this form)</div> <div>The main game rules in the game are the player must collect credits, complete coursework tasks, and reach the MCS building within a set time limit. Every decision made by player will spend amount of time. The player wins the game by successfully completing all the coursework and reaching the MCS building within the time limit. The difficulty of the game is determined by two factors: the number of coursework tasks and the difficulty in finding the MCS building. The player must balance their time between completing coursework and finding the path to the MCS building. The game ends either when the player successfully completes all tasks and reaches the MCS building within the time limit or when they fail to do so.</div>
Control and growth of game object abilities:	<div></div> <div>(*All images can be found at end of this form)</div> <div>Enemy (Lazy factors): Player can jump on the top of enemy and kill them. If enemy hit player, player will lose one credit.</div> <div>Player: Player can collect coins by hitting mystery blocks or find mystery room to collect them directly.</div>
Good use of game engine (12%)	

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Justification of the choice of game engine (pyGame, Unity [with version number]) in terms of game theme matching and expected target audience (game player):	Unity 2021.3.17f1(LTS) was chosen as the game engine for the MCS and Durham CS introduction game due to its compatibility with the game's theme and target players. Unity offers advanced physics, animations, multiple game assets, scene management and storage, making it possible to create a complex, challenging, and fun game.
User input supported (keyboard, mouse, joystick, etc.):	Keyboard: A for left, D for right, W for up and S for down, space for jump. Mouse: Click button to make options.
Game object interaction supported (e.g., event triggering, collision detection):	The game involved Collision detection (Capsule Collider 2D & OnCollisionEnter2D) to identify if player hit by enemy or does enemy be killed by player. Additionally, the game also uses Trigger event (OnTriggerEnter2D) to identify if player touch the coins/ MCS building entrance, then make response. The game also contains animation (IEnumerator) for both player and enemy including moving, jumping and get into the pipe. Lastly, some game object has Rigid body physic to add on the physic movement and response, such as gravity, move speed etc.
Extra game engine features used (e.g., asset, incorporation of external libraries):	The game uses free Unity assets from unity store to build environment such as 8K sky assets , the game also incorporation with code from Mario bros & 2048 and make additional adjustments based on the target game story and theme. The game also using other spirts from sprites website ¹ to build level environments and characters. Some game assets are made by me by using Logic Pro such as two main music's and pixel version of Frederick Li. ²
Good use of multimedia technologies (30%)	
Effective use of multimedia technologies to improve and widen user experience in term of what they see, hear and interact:	<p>The game uses BC1 as GPU-supported texture compression method for images, and game engine to edit music and sound, adjusting pitches and 3D effects for a better level environment. To be able to provide good interaction experience also involved some physic functions such as Newtonian physics to provide general rules and Euler Integration and smooth animations.</p> <p>Euler Integration in physics object:</p> <pre>// check which way user pressed _inputAxis = Input.GetAxis("Horizontal"); // calculate horizon velocity, and make sure it has been updated over time _velocity.x = Mathf.MoveTowards(current: _velocity.x, target: _inputAxis * moveSpeed, maxDelta: moveSpeed * Time.deltaTime);</pre>

¹ <https://www.spritters-resource.com/nes/supermariobros/>

² More details in ReadMe file.

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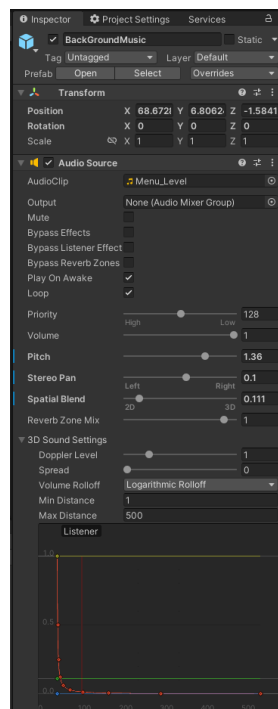
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Apply Newtonian physics:

```
⚡ Frequently called  ☑ 1 usage
private void ApplyGravity()
{
    bool falling = _velocity.y < 0f || Input.GetButton("Jump");
    float gravityFactor = falling ? 2f : 1.5f;

    _velocity.y += Gravity * Time.deltaTime * gravityFactor;
    _velocity.y = Math.Max(_velocity.y, Gravity / 2f);
}
```

Audio example:

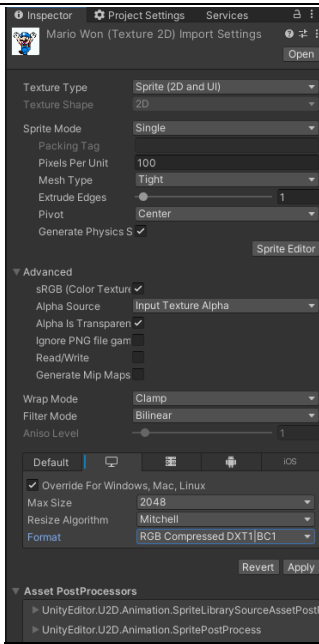


GPU-supported texture compression example:

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Advanced object interaction and behaviour (e.g., game physics, object tracking, steering behaviour):	<p>The game applied good <u>physic detection</u> such as set <u>different gravity</u> and <u>jump force</u> for player jumping and falling, also set different velocity value into different direction when player is walking on the ground or jumping or hit the block. To be able to provide good interaction experience also involved some physic functions such as <u>Newtonian physics</u> to provide general rules and <u>Euler Integration</u> to increase user experience. The enemy was moving by using <u>easy auto-motion method</u>.</p> <p><u>Example of setting gravity in falling and jumping:</u></p> <pre> Frequently called 1 usage private void ApplyGravity() { bool falling = _velocity.y < 0f Input.GetButton("Jump"); float gravityFactor = falling ? 2f : 1.5f; _velocity.y += Gravity * Time.deltaTime * gravityFactor; _velocity.y = Math.Max(_velocity.y, Gravity / 2f); } </pre> <p><u>Example of adding jump force:</u></p> <pre> // if press button jump, then set vertical speed as jump force if (Input.GetButtonDown("Jump")) { _velocity.y = JumpForce; Jump = true; _jumpAudioSource.Play(); } </pre>

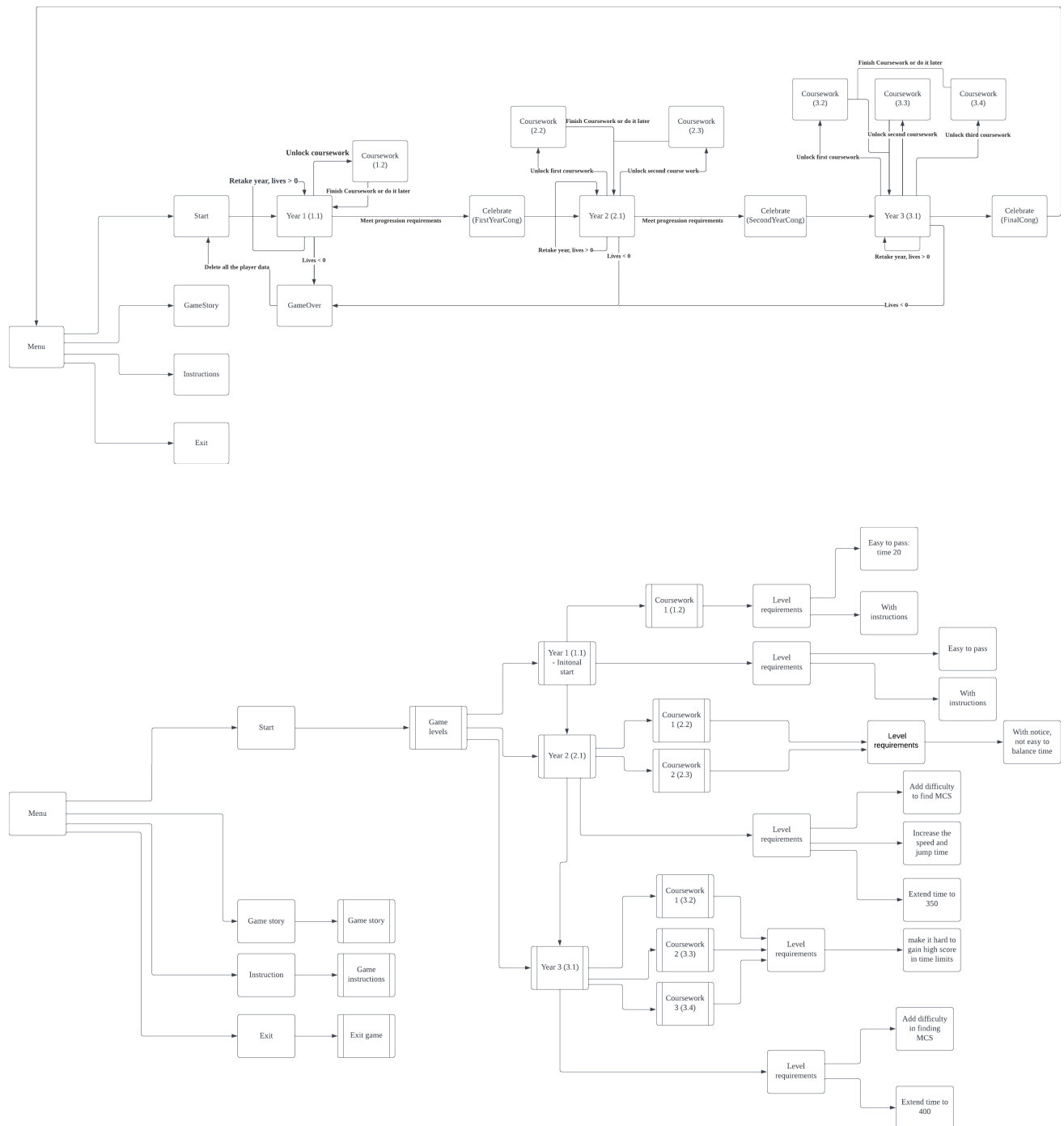
***Note:** Your work must be done by yourself and comply with the university rules about plagiarism and collusion. (<https://www.dur.ac.uk/learningandteaching.handbook/6/2/4/>)

* Game flow and how it is designed (e.g., scene navigation, level design):

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* Main game rules/logics to control game progression, difficulty, and end game conditions:

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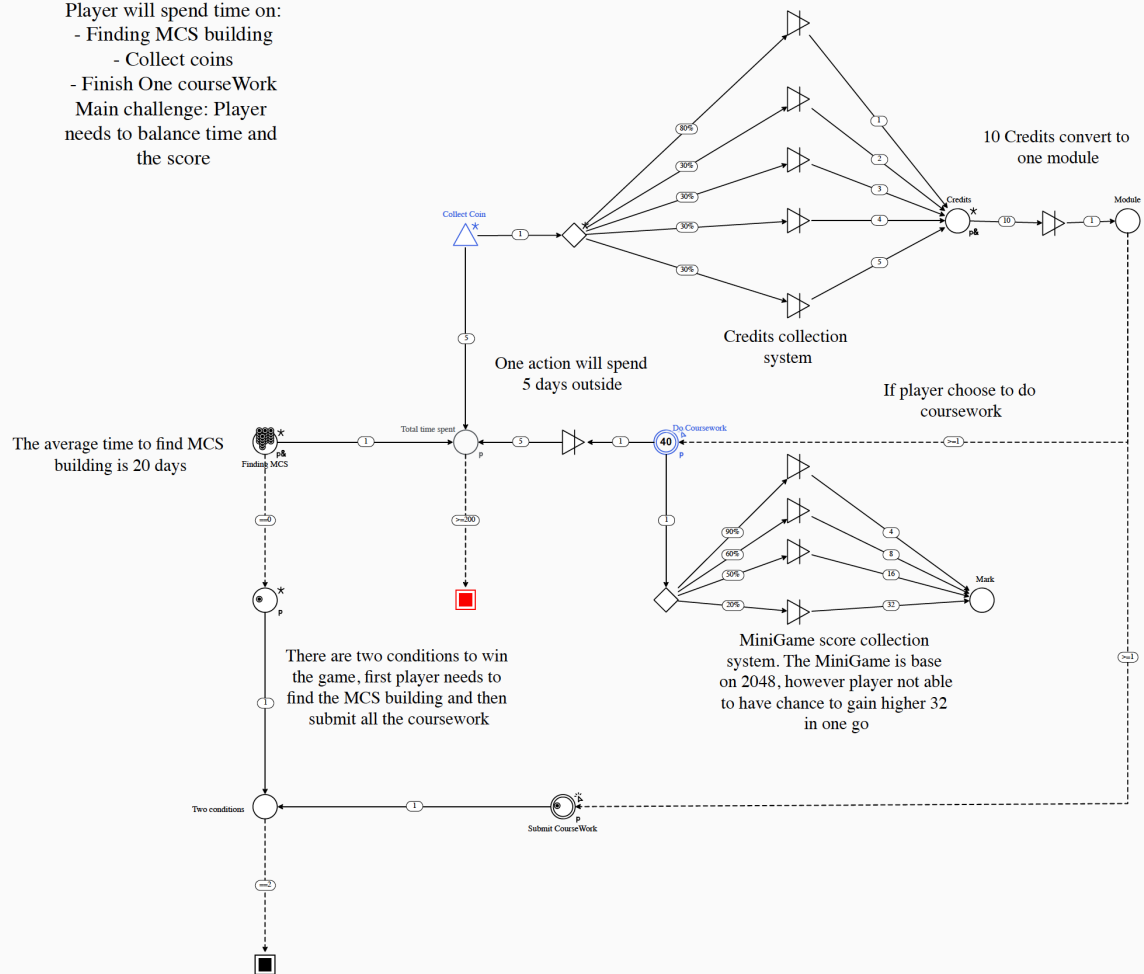
Level 1

Player will spend time on:

- Finding MCS building
- Collect coins

- Finish One courseWork

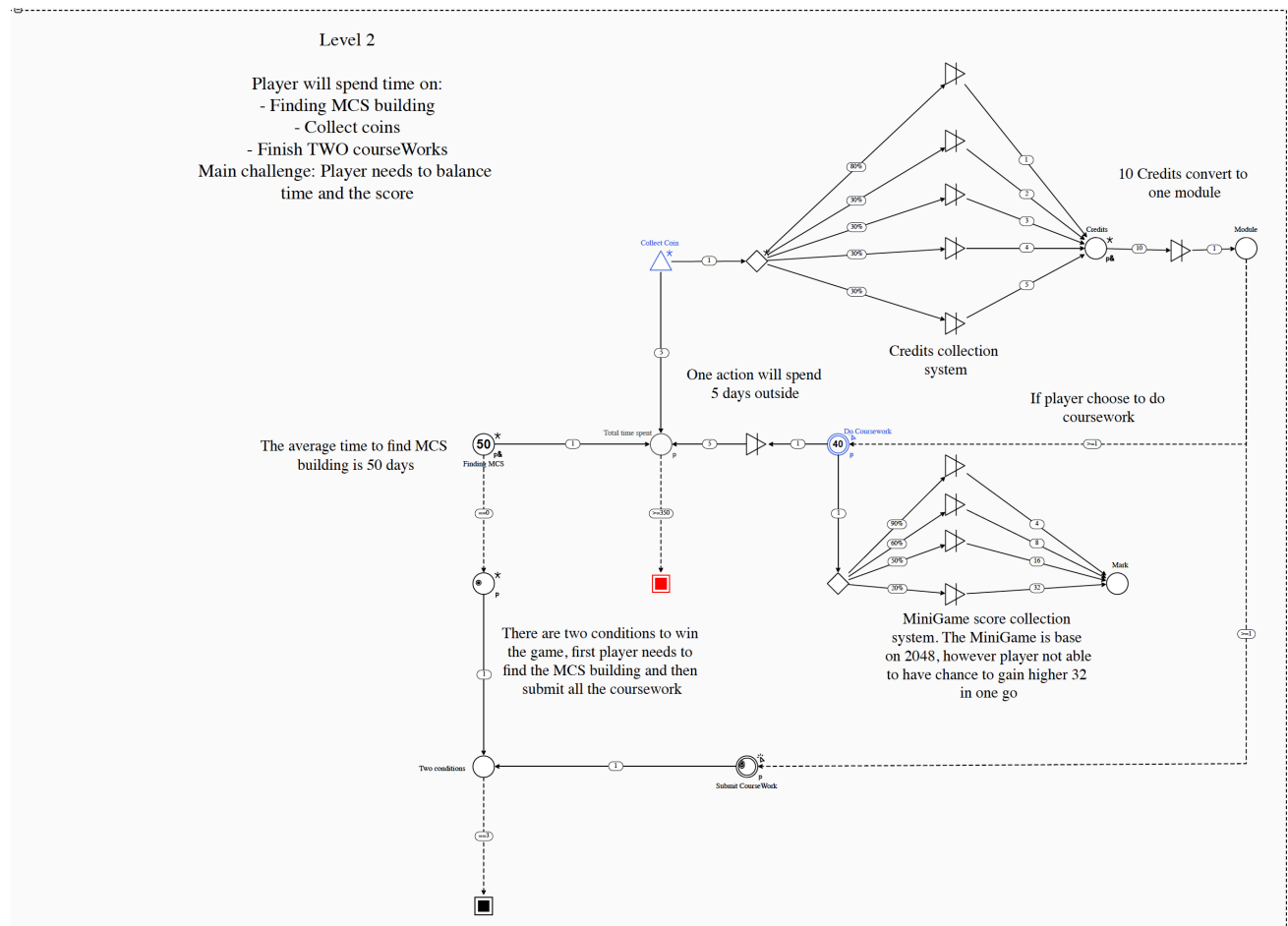
Main challenge: Player needs to balance time and the score



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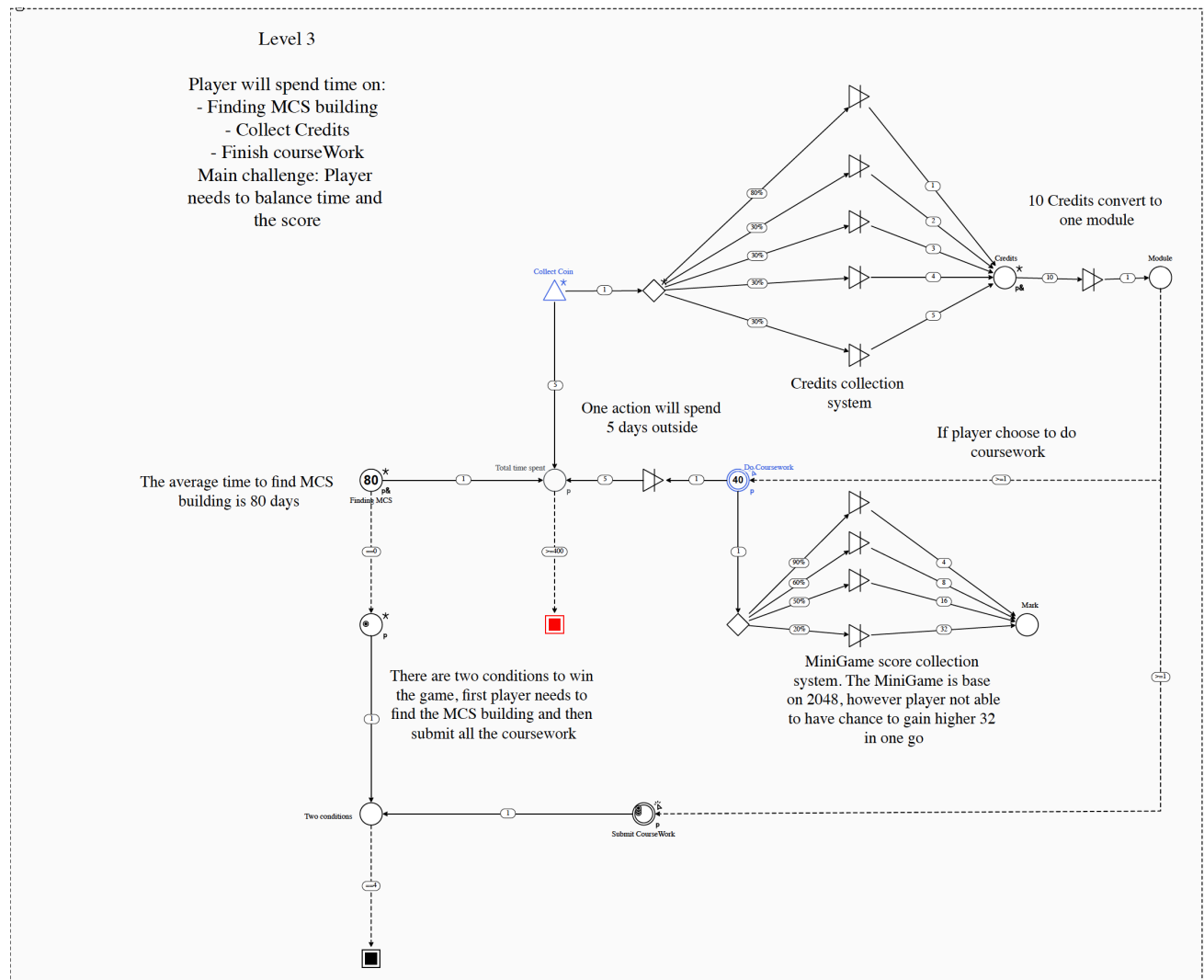
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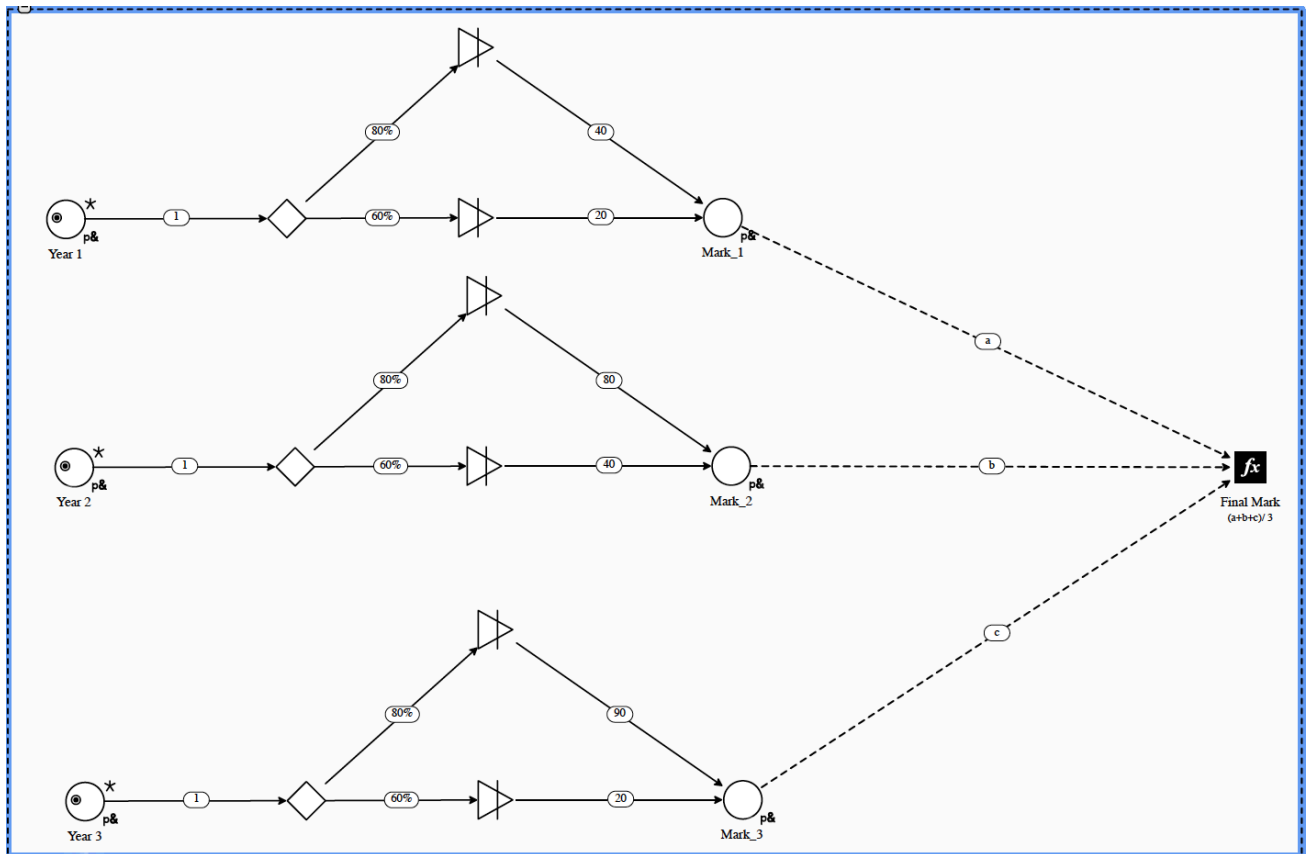
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Game economy

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Gain Credits:

Time: Player would spend average 5 days to have a chance to get credits.

Value of credits: Player has high chance to get 0 or 1 credit, and has low chance to gain 2-5 credits in one go.

Time

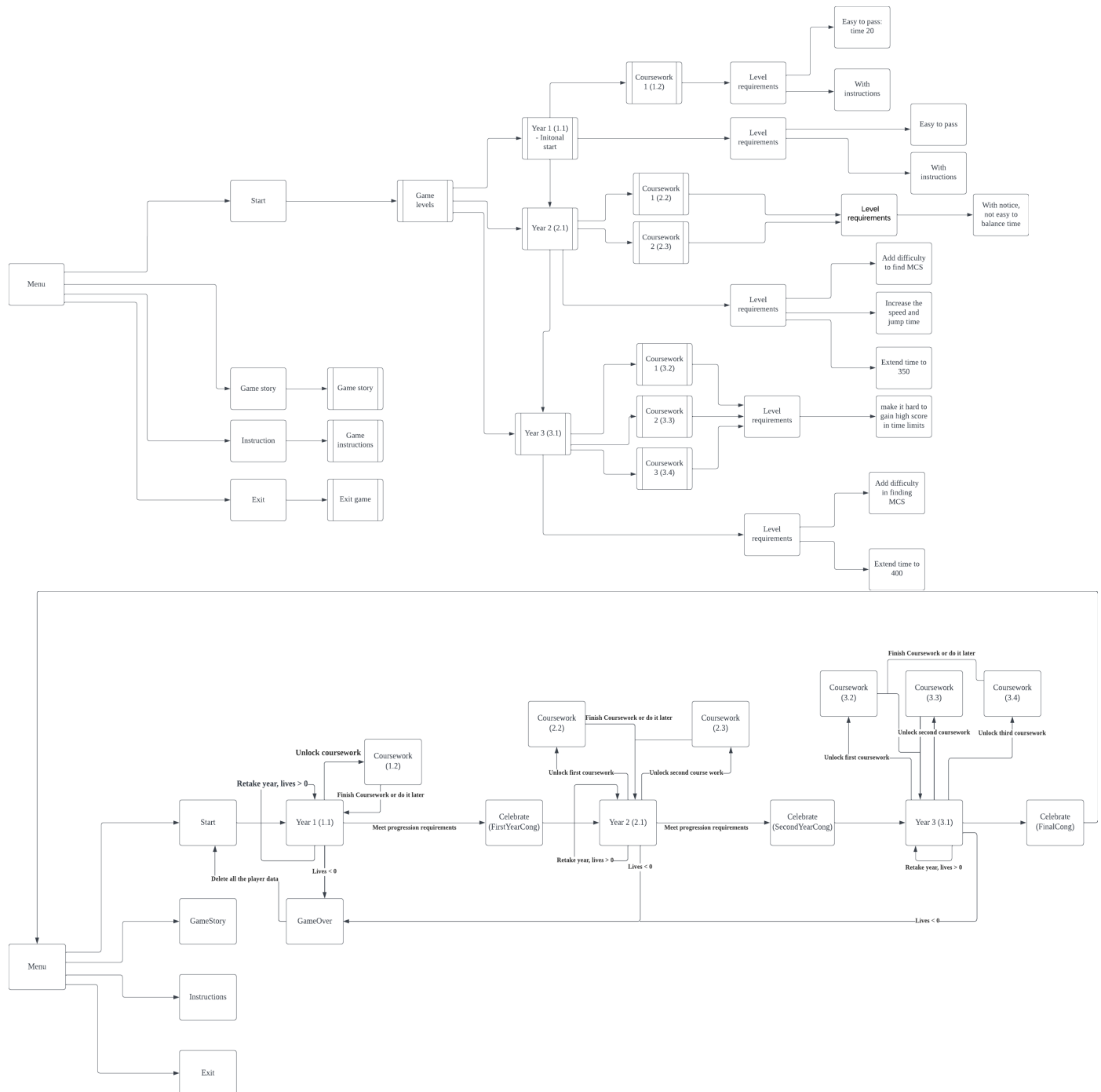
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Major Game's 1 day is real life's 1 second
Mini Game's 1 day is player's one action.

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*Control and growth of game object abilities:

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