### **Test Plan**

#### **Overview**

This document outlines the steps required to user-test the game, including key bindings, mouse actions, and expected behavior during gameplay. This plan will guide the TAs on how to test and grade the game.

#### **Controls**

**Player 1 (Blue Player):**

* **Move Left:** Press A
* **Move Right:** Press D
* **Jump:** Press W
* **Shoot:** Press Q, E

**Player 2 (Red Player):**

* **Move Left:** Press Left Arrow
* **Move Right:** Press Right Arrow
* **Jump:** Press Up Arrow
* **Shoot:** Press /, right-shift

**Other Game Actions:**

* **Help Menu**: Press H to toggle the help menu.
* **FPS Counter**: Visible in the game window's caption.

#### **Game Actions**

* **Welcome and Stage Select Pages:**
  + Launch the game.
  + Verify that the welcome page appears with an option to proceed to stage selection.
  + Select a stage and confirm the game starts on the selected stage.
* **Movement:**
  + Use the specified keys to move your player left or right.
  + The player can jump by pressing the jump key when on the ground.
* **Shooting:**
  + Press the shoot key to fire a projectile in the direction the player is facing. The player can shoot in rapid succession, but there’s a delay between shots.
* **Collision:**
  + Players can collide with platforms and other players. Bullets will decrease a player’s health when hit.
* **Victory Condition:**
  + Each player starts with 10 healthIf a player's health reaches zero, the game declares the opposing player as the winner.
* **Laser:**
  + A laser entity appears randomly, driven by AI with a decision tree and pathfinding. The laser chooses the closest player as its target and adjusts its path if the player moves. After each fire, it will stop for 2 seconds.

#### **Test Cases**

1. **Start Game:**
   * Run the game by launching the executable.
   * Ensure that the background music starts playing immediately.
2. **Player Movement:**
   * Test both players’ movements (left, right, jump) using the appropriate keys.
   * Verify that players stop at screen boundaries and platforms.
3. **Shooting Mechanism:**
   * Ensure that each player can shoot by pressing their respective shoot key.
   * Verify that bullets are visible and travel in the correct direction.
4. **Collision Testing:**
   * Test player-to-platform collisions to ensure players can stand on platforms and jump correctly.
   * Ensure that bullets collide with players,player dies after 10 shoot
5. **Winning Condition:** 
   * Ensure that game restart when a player dead
6. **Laser Testing:**
   * Verify the laser moves toward the closest player and dynamically updates its path if the players change positions.
   * Verify the laser has three stages: track, attack and idle
   * Verify that the random laser appears in the game.
7. **Help Menu**
   * Press H to display the help menu, release H to close it.
   * Verify the help menu appears and disappears correctly without interfering with other game elements.
8. **FPS Counter:**
   * Launch the game and observe the game screen.
   * VerifyFPS counter is visible and updates regularly.
9. **Portal:**
   * Move Player 1 or 2 to the first portal's location.
   * Verify Player 1 instantly teleports to the position of the other portal.(and repeat for Player 2)
10. **Animation:**
    * Verify that the animation triggers and transitions smoothly when the player starts, stops, or changes movement direction, without stuttering or delay.
11. **Assets:**
    * Verify that the updated background, player design, and gun design load correctly, display as intended during gameplay, and integrate smoothly with all animations and interactions.
12. **Player Collision with Portal Mesh:**
    * Verify the player collides accurately with the portal's non-trivial mesh shape, triggering teleportation only when fully within the portal bounds, without passing through unintended areas of the mesh.
13. **Item System:**
    * Laser Items:
      1. Pick up a laser item and verify that the player can fire a powerful laser attack.
    * Health Medics:
      1. Collect a health medic and confirm the player’s health increases correctly.
    * Grenades:
      1. Use grenades by pressing the assigned key.
      2. Ensure grenades launch properly, interact with the environment, and deal explosive damage.

### **Additional Test Cases**

1. **Stage Selection Validation:**
   * Confirm that all stages load correctly and that stage-specific assets and mechanics function as expected.
2. **Random Portal Respawn:**
   * Test multiple portal uses to ensure the portals respawn randomly on valid block locations.
3. **Enhanced Bullet Realism:**
   * Verify that realistic bullets interact correctly with the environment, such as platforms or players.
   * Confirm bullets travel in an arc or a visually realistic straight line depending on design.
4. **Health System:**
   * Ensure health medics work correctly and the updated health text reflects changes accurately.
5. **Game Result History**
   * Play multiple matches and check the results screen after each match.
   * Ensure the outcomes of the past 10 matches are saved and displayed correctly.