

# **BTEC Level 3 Extended Diploma Computing**

## **Year 2**

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### **Unit 14:** Computer Games Development

#### **Assignment: 2**

Design & Development a Computer Game

# **Game Design Document**

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**Date: 26/04/2024**

## Contents

<b>Project Outline</b>	<b>4</b>
<b>Requirements from the Brief</b>	<b>4</b>
Client Requirements	4
Purpose of the Game	4
Target Audience for the Game	4
<b>Overview of the Game</b>	<b>5</b>
<b>Game Setting/Environment</b>	<b>5</b>
<b>Type of Gameplay and Gameplay Features</b>	<b>6</b>
<b>Characters</b>	<b>6-7</b>
<b>Visual Style for the Game</b>	<b>7</b>
<b>Levels and/or Progression of Difficulty</b>	<b>8</b>
<b>User Interface &amp; User Instructions</b>	<b>8-10</b>
<b>Storyboard - Game Design (1) with Annotations</b>	<b>11</b>
<b>Storyboard - Game Design (2) with Annotations</b>	<b>12</b>
<b>Storyboard - Game Design (3) with Annotations</b>	<b>13</b>
<b>Assets Required for the Game</b>	<b>14-15</b>
Assets List	14-15
<b>Programming Documentation</b>	<b>16-18</b>
Data Dictionary	16-17
Algorithm Design: Pseudocode for Key Functions in the Game	18
<b>Flowchart for Progression Through the Game</b>	<b>19</b>
<b>Game Development Production Schedule</b>	<b>20-22</b>
Task Descriptions & Timescales	20-21
Resources Required	22
<b>Test Plan/Log</b>	<b>23-31</b>

# **Game Design Documentation**

## **for**

# **Cosmic Defenders**

## Project Outline

For this project, I will be creating a game similar to space invaders titled Cosmic Defenders. In this game, the player takes control of a spaceship and has to defeat the alien enemies that will be shooting projectiles at the user. The player will have 3 lives which can be lost either by the enemies making it to the players side or a projectile hits the player. The game will also get harder and levels will begin depending on the amount of enemies the player defeats, with the game having 5 levels and if the player beats the 5th level then they beat the game.

## Requirements from the Brief

### Client Requirements

The client requirements for the game are that the game appeals to 7-11 year olds and that it involves a character navigating a character around an area collecting items but avoiding hazards. Collecting items adds to the player's score but colliding with hazards uses up lives, which the player only has a limited amount. The game should also be timed and the performance should be based on the score achieved over a certain time. Levels of difficulty should also be included with more challenging levels having more hazards, fewer lives or a shorter time.

### Purpose of the Game

The purpose of the game is to be fun to play for students so that teachers can use it as a reward for students and that if the game is successful in the future, it will be supported with more educational content such as sensory perception, maths etc. The game needs to be able to inspire students and encourage the learning process of students.

### Target Audience for the Game

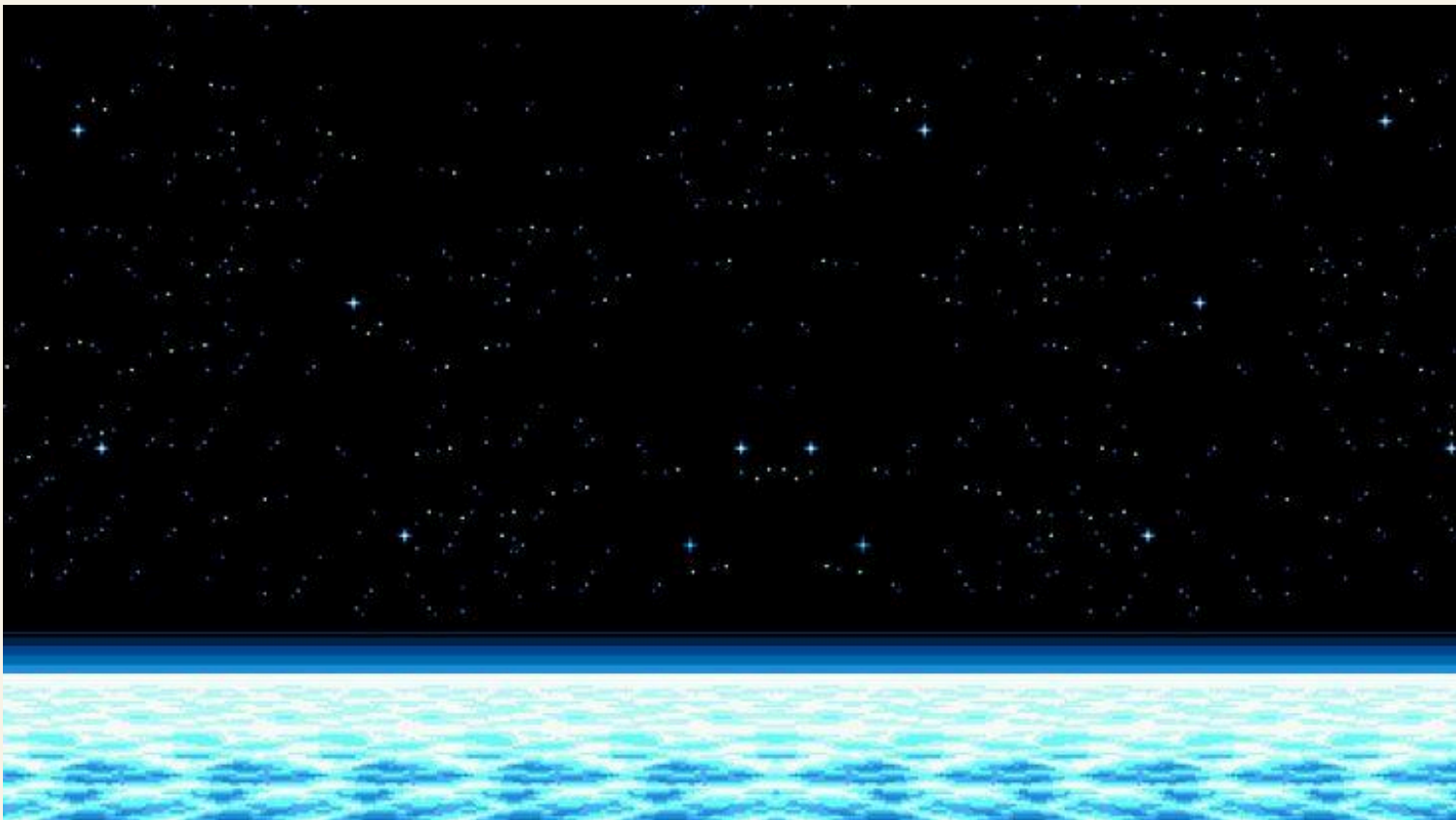
The games main target audience will be 7-11 year olds since this game will be used for children in that age group and for educational purposes. The game will also need to appeal to both a male and female audience, however because this game will be used for education and a pastime, girls may also enjoy this game as a break from education. Since this will eventually be added in the future with an educational mode, simple equations or other things can be added to make Cosmic Defenders more educational in the future for the target audience. Cosmic Defenders will also use pixel style assets so that it can appeal to the target audience and not be too violent.

## Overview of the Game

Cosmic Defenders is a game similar to space invaders which involves the player controlling a spaceship and destroying the enemies that are aliens. The plot of the game is that the aliens are invading earth and it is the spacemens job to protect the planet and wipe out the Aliens from taking over and invading earth. The player has 3 lives, which can be lost if the alien goes over to the other side or if the Alien collides with the player or the bullet hits the player. The player has to stop the Alien invasion which gets harder and harder since the game has 5 levels of difficulty. Once the player beats all 5 stages, they beat the game and get congratulated for it.

## Game Setting/Environment

The environment and game setting for the game will be set in space, with planet earth being shown in the background since that is what the player needs to protect. The background will not be very detailed since it could blend in with the other enemies and players which can make it difficult to see the other assets of the game. UI elements will also have to be added in such as text to show the score, lives remaining and current level of the enemies coming in.

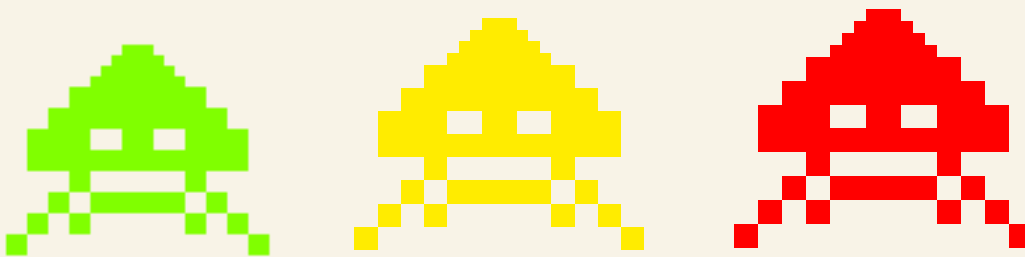


## Type of Gameplay and Gameplay Features

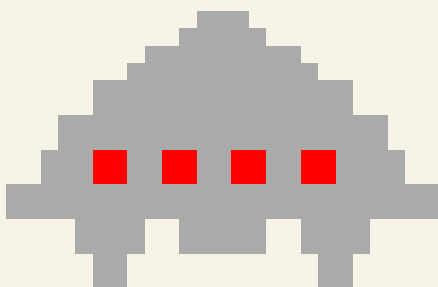
The type of gameplay that will be in the game is that the player controls the spaceship using the WASD keys and shoots with the space bar. The spaceship will be able to go up, down, left and right with the corresponding keys and the player needs to shoot a certain amount of enemies that appear in order to go to the next level. As the levels and enemies progress, the game gets harder and harder and more and more enemies will come and try to shoot the user. Enemies will also have different designs and on the 5th level, a much harder enemy will appear as a final boss for the user. Different enemies will have different rankings depending on how strong they are and they will also have more HP and will be harder to take down. Upon clearing a stage, the user will also get an extra live. This incentivises the user to keep playing as it is a risk/reward system, the longer the user survives the more lives they get which prevents them from dying.

## Characters

Enemies (Green appear at level 1, yellow at level 2, red at level 3, each with more HP)



Final Boss (Appears at level 5)



## Player controlled Spaceship



Protagonist (only appears on the title screen)



### Visual Style for the Game

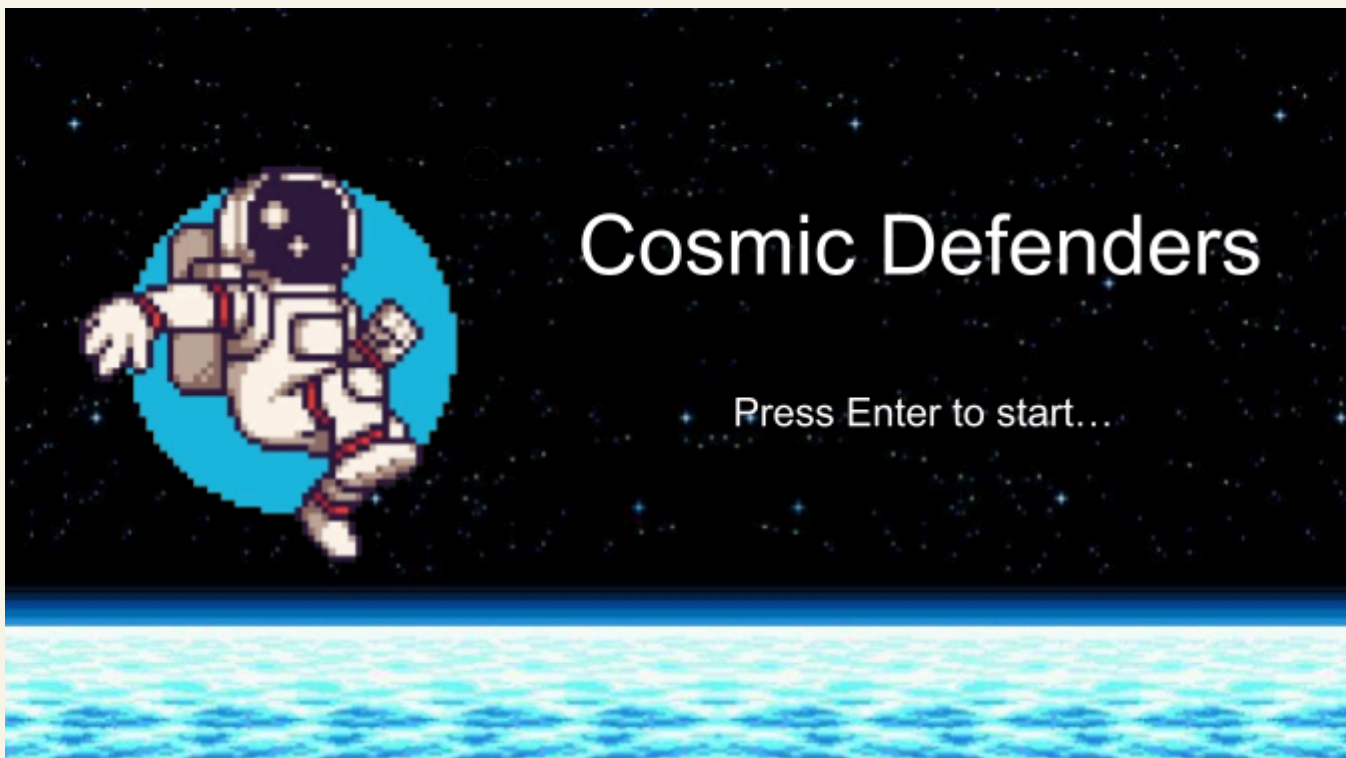
As for the visual style for the game, this game will use a pixelated and retro style for all the assets. This helps make the game appeal to 7-11 year olds by having a style that represents simple games and games that this type of target audience is already familiar with. In addition to this, a retro style like this also fits this game as the game is inspired by space invaders. Since the game also appeals to 7-11 year olds, the visual style for the game needs to not be violent and instead, a simpler and child friendly style needs to be used. Using a pixel style also allows the game to be simple, not have high requirements to be played and allows for an aesthetically pleasing art style for the game.

## Levels and/or Progression of Difficulty

The levels and progression of difficulty in the game will be based on how many enemies the player defeats to be able to get to the next level. The game will have 5 levels, with the player defeating a certain number of the enemies to get to the next level of difficulty. The first level will have only the green aliens and the player will have to defeat 10 of them to get to the next level. The green aliens will die based on 1 hit. Then the second stage, the player will have to defeat 20 of the yellow enemies that will have 2 hit points, third stage will have the red enemies which die on 3 hit points and there are 30 of them and then the 4th stage will have a mix of all 3 aliens and the player will have to defeat 40 of the aliens. The final stage will have the special boss, which fires 2 missiles at once, is a lot faster and needs to be hit a certain amount of times until he goes down. He will have a life bar which needs to be taken down for him to die. Once the 5th stage is complete, the player will have completed the game.

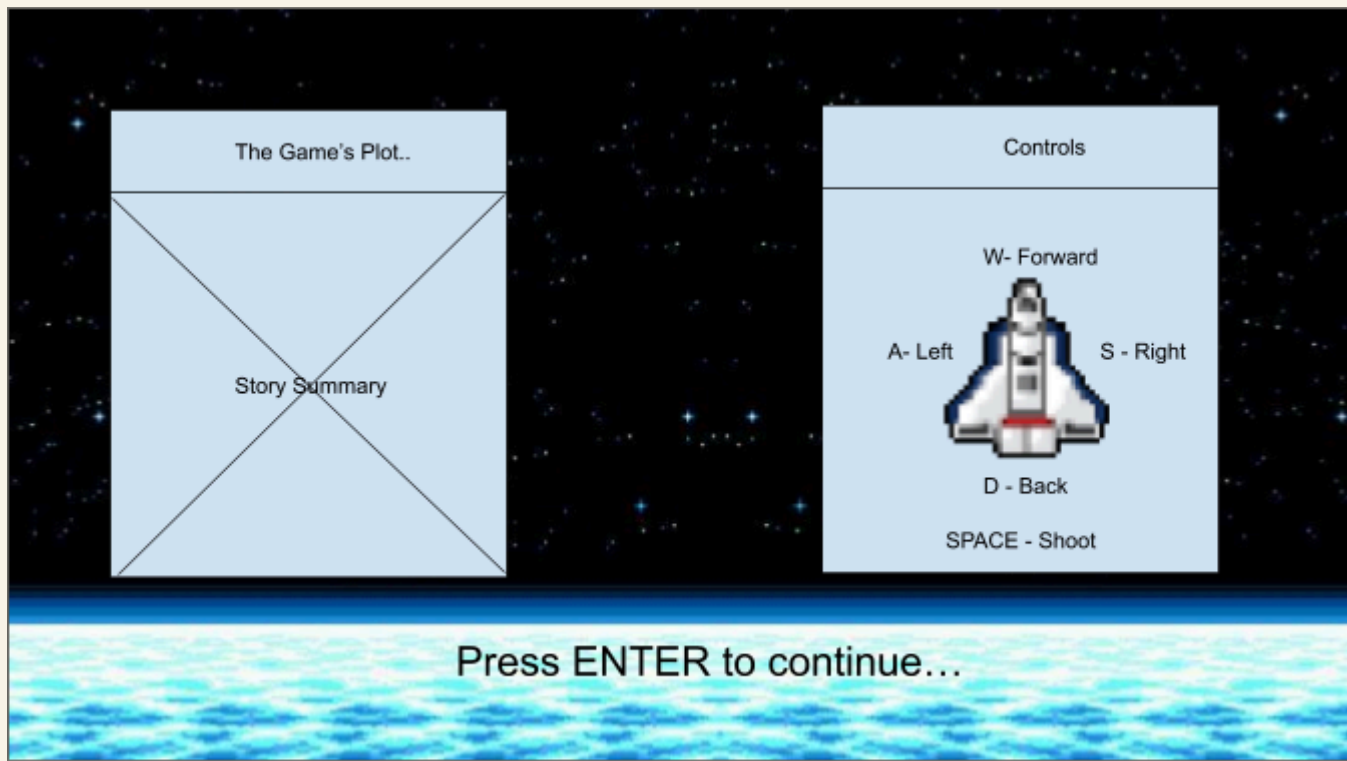
## User Interface & User Instructions

Mockup title screen





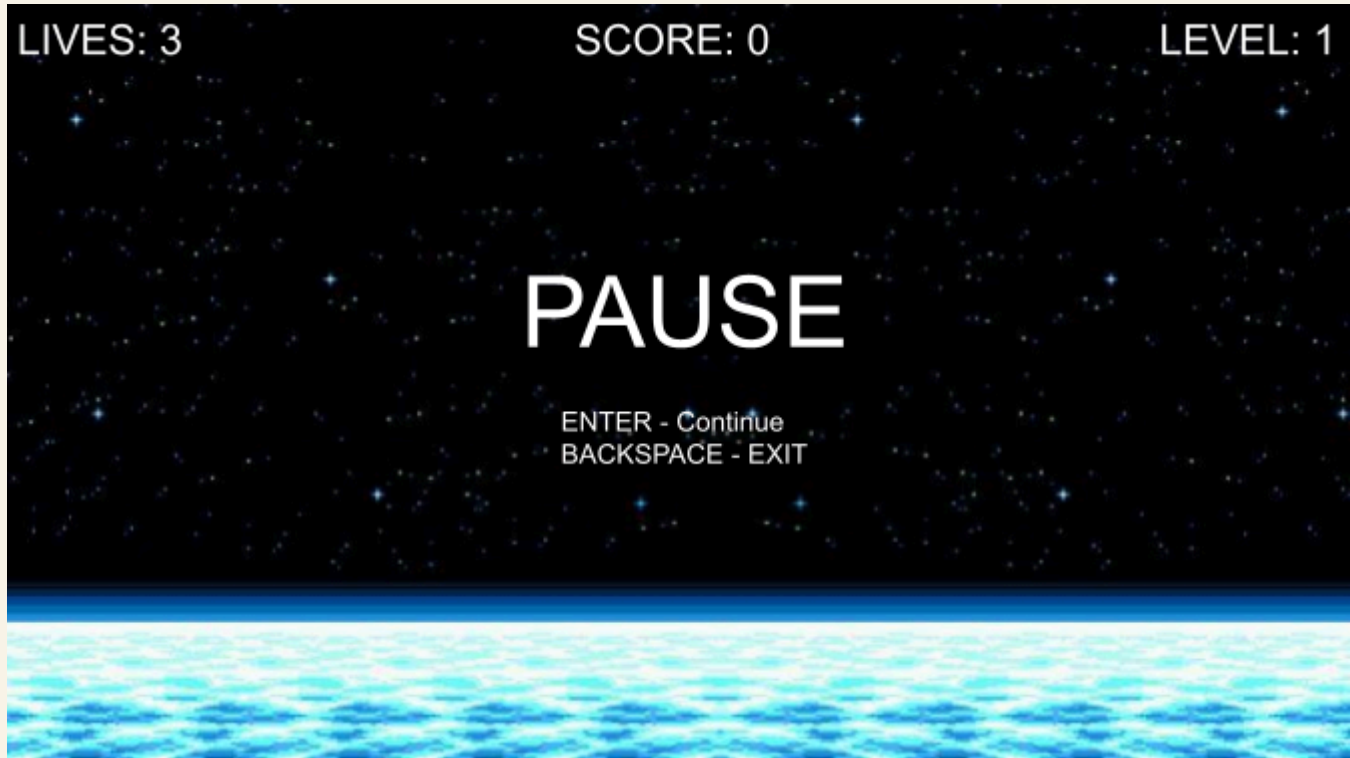
## Mockup control and story summary



## Mockup Gameplay:

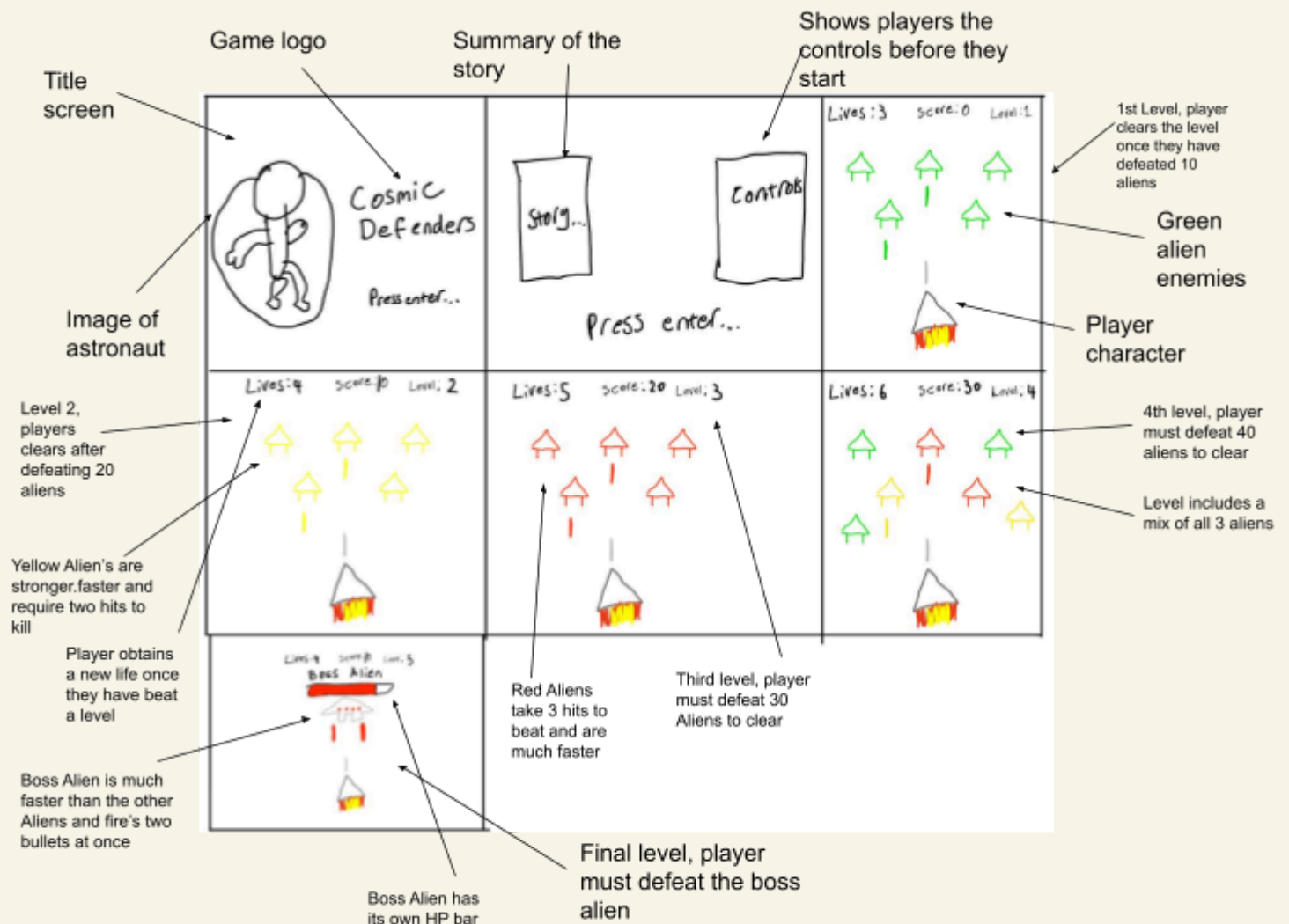


Pause Menu Mockup:



## Storyboard - Game Design (1) with Annotations

Including Landing Page



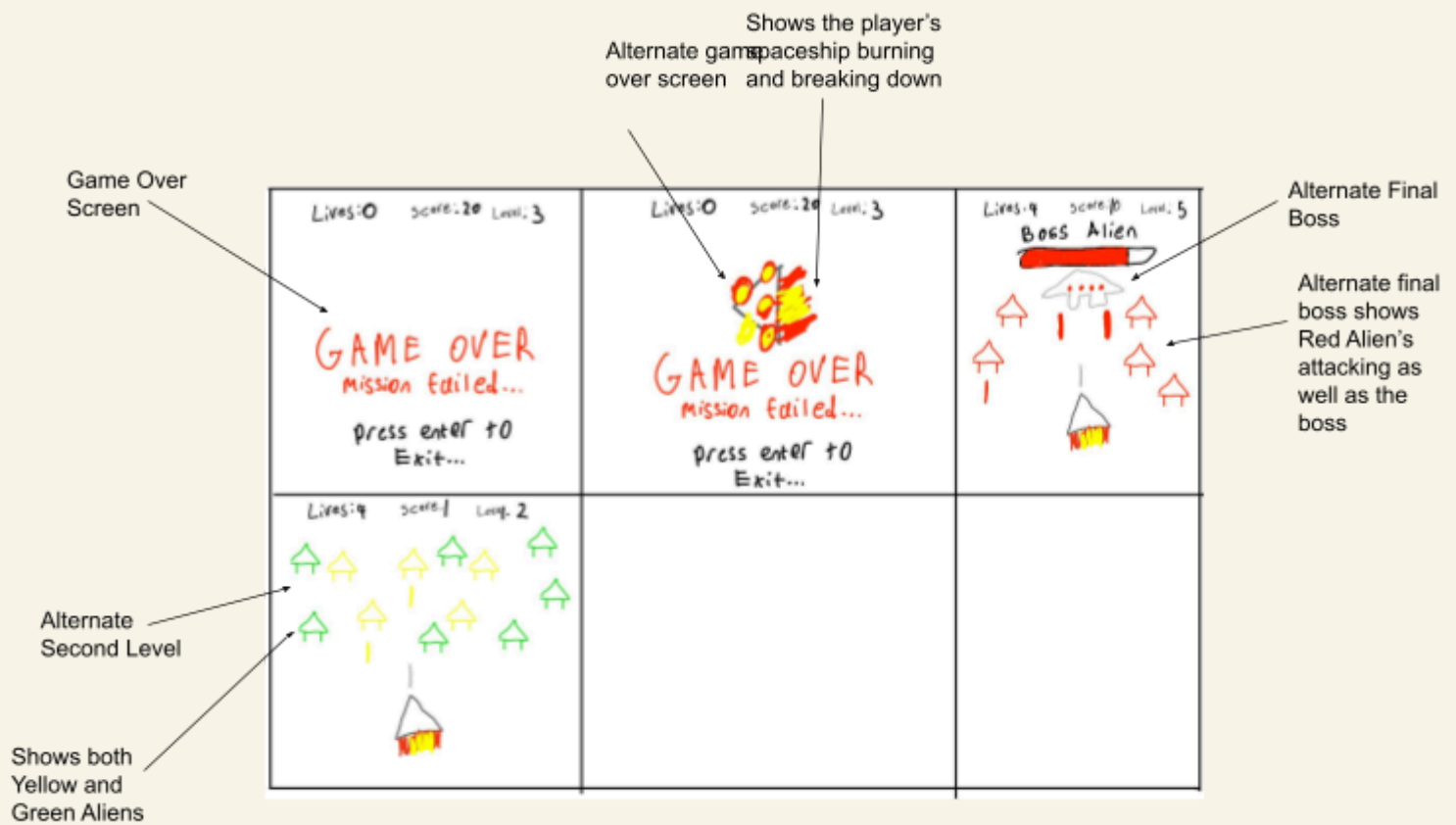
## Storyboard - Game Design (2) with Annotations

Including Landing Page



## Storyboard - Game Design (3) with Annotations

Including Landing Page



## Assets Required for the Game

### Assets List

Description of the Asset to be used	File name	Source of the Asset	Type: Graphical / Video / Audio
Game Background	SpaceBackground.JPG	Pinterest	Image
Protagonist	TitleScreenProtag.PNG	Pinterest	Image
Spaceship with no flame	Spaceship1.PNG	Pinterest	Image
Spaceship with flame activated	Spaceship2.GIF	Pinterest, however I had edited the flame using Piskel	Graphical
Spaceship with moving flame	Spaceship3.GIF	Pinterest, however I had edited the flame using Piskel	Graphical
Spaceship shooting beam	SpaceshipBeam.PNG	Created using Piskel	Image
Green Alien enemy	GreenAlien.GIF	Created using Piskel	Graphical
Green Alien shooting beam	GreenBeam.PNG	Created using Piskel	Image
Red Alien enemy	RedAlien.GIF	Created using Piskel	Graphical
Red Alien shooting beam	RedBeam.PNG	Created using Piskel	Image
Yellow Alien enemy	YellowAlien.GIF	Created using Piskel	Graphical
Yellow Alien shooting beam	YellowBeam.PNG	Created using Piskel	Image
Final Boss	FinalBoss.PNG	Created using Piskel	Image
Final Boss shooting Beam	BossBeam.PNG	Created using Piskel	Image
Final Boss HP Bar	BossHP.PNG	Created using Piskel	Image
Game Logo	Logo.PNG	Created using Piskel	Image
Title Screen Music	TitleMusic.MP3	Youtube	Audio
Level Music	LevelMusic.MP3	Youtube	Audio
Final Boss Music	BossMusic.MP3	Youtube	Audio
Game Clear Sound	ClearSound.MP3	Youtube	Audio

Spaceship flame sound	ShipSound.MP3	Youtube	Audio
Spaceship shoot sound	ShootSound.MP3	Youtube	Audio
Enemy Shoot sound	EnemyShoot.MP3	Youtube	Audio
Enemy Explosion sound	ExplosionAudio.MP3	Youtube	Audio
Final Boss shoot sound	BossShoot.MP3	Youtube	Audio
Boss Death sound	BossDeath.MP3	Youtube	Audio
Pause menu sound	PauseSound.MP3	Youtube	Audio

## Programming Documentation

### Data Dictionary

Variable/Constant Name	Data Type	Purpose
Score	Integer	Store the number of enemies the player has defeated.
Lives	Integer	Store the lives that the player has and reduce them if an enemy hits the player or increase the life once the player has cleared the level.
Level	Integer	Progress the level once the user has defeated the set number of enemies.
Player_Beam	Integer	store the player's shooting beam so that it reduces the health of enemies once the beam hits.
Green_Alien	Integer	Reduce the life of the alien if the player beam hits the alien and clear the alien off the screen if they have been hit once.
Yellow_Alien	Integer	Reduce the life of the alien if the player beam hits the alien and clear the alien off the screen if they have been hit twice.
Red_Alien	Integer	Reduce the life of the alien if the player beam hits the alien and clear the alien off the screen if they have been hit three times.
Boss_Alien	Integer	Store the HP of the boss Alien and reduce its HP once the player beam hits the alien. If the alien is hit 30



		times then the boss has been defeated and the player has beaten the game
Alien_Beam	Integer	Store the alien beam so that if the beam hits the player, the player's life is reduced by 1.

**Algorithm Design: Pseudocode for Key Functions in the Game**

```
START
  WHILE game is running:
    IF title screen is displayed and Enter is pressed:
      display game screen

      IF Player presses W:
        move spaceship up
      ENDIF

      IF Player presses A:
        move spaceship left
      ENDIF

      IF Player presses D:
        move spaceship right
      ENDIF

      IF Player presses S:
        move spaceship down
      ENDIF

      IF Player presses SPACE:
        create Player_Beam
      ENDIF

      MOVE Alien down

      IF Alien reaches bottom of screen:
        respawn Alien at top
      ENDIF

      IF Player_Beam hits Alien:
        destroy Alien
        increment Player score by 1
      ENDIF

      IF Alien shoots beam:
        CREATE Alien beam
      ENDIF

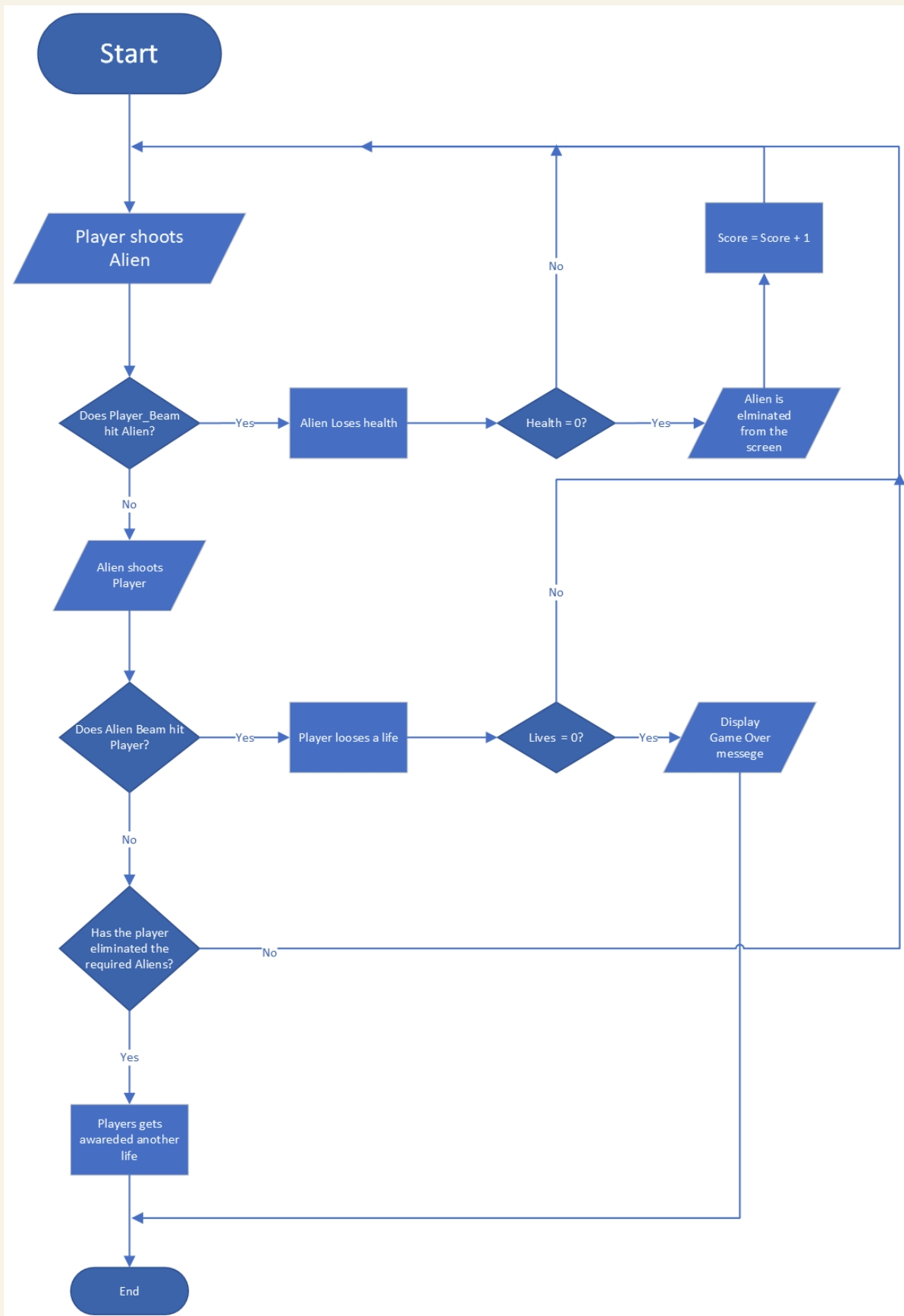
      IF Alien_Beam hits Player:
        decrement Player Lives by 1
      ENDIF

      IF Player collides with Alien:
        decrement Player Lives by 1
      ENDIF

      IF Lives == 0
        DISPLAY game over screen
      ENDIF

      IF Score == 10
        DISPLAY Level 2
        increment Lives by 1
      ENDIF
    ENDIF
  ENDWHILE
END
```

## Flowchart for Progression Through the Game



## Game Development Production Schedule

### Task Descriptions & Timescales

#### 1. Game Design Document: 13/03/2024 - 30/04/2024

Project Outline: 13/03/24 - 13/03/24

Client Requirements: 14/03/24 - 14/03/24

Purpose of the Game: 14/03/24 - 14/03/24

Target Audience for the game: 14/03/24 - 14/03/24

Overview of the Game: 15/03/24 - 15/03/24

Game Setting/Environment: 15/03/24

Types of Gameplay and Gameplay Features: 15/03/24

Characters: 15/03/24: 21/03/24

Visual Style for the Game: 22/03/24 - 22/03/24

Levels and/or Progression of Difficulty: 22/03/24 - 22/03/24

User Interface & User Instructions: 22/03/24 - 22/03/24

Storyboard - Game Design (1) with Annotations: 26/04/24 - 30/04/24

Storyboard - Game Design (2) with Annotations: 26/04/24 - 30/04/24

Storyboard - Game Design (3) with Annotations: 26/04/24 - 30/04/24

Assets list: 24/04/24 - 24/04/24

Data Dictionary: 24/04/24 - 24/04/24

Algorithm Design: Pseudocode for Key Functions in the Game: 24/04/24 - 30/04/24

Flowchart for Progression throughout the game: 24/04/24 - 15/04/24

Task Descriptions & Timescales: 25/04/24 - 25/04/24

Resources Required: 25/04/24 - 26/04/24

Test Plan/Log: 26/04/24 - 26/04/24

## **2. Review of Game Designs: 01/05/2024 - 02/05/2024**

Introduction: 01/05/24 - 01/05/24

Review of Game Designs With Others: 01/05/24 - 01/05/24

Suggested Game Design Improvements Following Feedback: 01/05/24 - 01/05/24

Justification of Game Design Choices Made: Purpose and Client Requirements: 02/05/24 - 02/05/24

## **3. Creating the Game: 04/05/2024 - 25/05/2024**

Creating and testing the game: 04/05/2024 - 22/05/2024

Screenprints of the Completed Game with Annotations: 23/05/2024 - 24/05/2024

Feedback from Others: Completed Game: 23/05/2024 - 23/05/2024

Review to the Extent to Which the Computer Game Meets Client Requirements: 25/05/2024 - 26/05/2024

## **4. Optimising the Game: 27/05/2024 - 30/05/2024**

Optimisation of the Computer Game to Meet Client Requirements: 27/05/2024 - 30/05/2024

Screenprints of the Optimised Game: 27/05/2024 - 30/05/2024

## **5. Evaluation: 31/05/2024 - 04/06/2024**

Evaluation of the Design and Optimised Game Against Client Requirements: 31/05/2024 - 03/06/2024

Conclusion: 03/06/2024 - 03/06/2024

Individual Work Log/Diary & Personal Gantt Chart/Activity List: 04/06/2024 - 04/06/2024

Self-Evaluation of Performance During the Project: 04/06/2024 - 04/06/2024



**Test Plan/Log**

Test No.	Description of Test	Expected Outcome	Actual Outcome	Changes Made (if necessary)
1	Press Enter to progress from the title screen	The Input is accepted		
2	Move the Spaceship up using W	The input is accepted and the spaceship moves up		
3	Move the Spaceship left using A	The input is accepted and the spaceship moves left		
4	Move the Spaceship Right using D	The input is accepted and the spaceship moves right		
5	Move the Spaceship Down using S	The input is accepted and the spaceship moves down		
6	Shoot a beam with the spaceship using SPACE	The input is accepted and the spaceship shoots a beam		
7	The Player's beam hit the Green Alien	The player's beam hits an Alien, the Alien is eliminated from the screen and a point will be added to the score.		
8	The Green Alien moves down	The Green Alien automatically moves down the screen		

9	The Green Alien shoots a beam	The green Alien automatically shoots a beam randomly		
10	The Green Alien's beam hits the Player	If the green Alien's beam hits the player, then the player's life will decrease by 1		
11	Collision test between the player and the Alien	If the Player hits/moves to the Alien, then the players life will decrease by 1		
12	Collision test between the player and the upside of the screen	The player character will not move out off the screen if the player goes too far up		
13	Collision test between the player and the downside of the screen	The player character will not move out off the screen if the player goes too far down		
14	The player character will not move out off the screen if the player goes too left	The player character will not move out off the screen if the player goes too far left		
15	The player character will not move out off the screen if the player goes too right	The player character will not move out off the screen if the player goes too far right		



16	Game Over test screen	If the player's lives reach 0 then the game will display a game over screen		
17	Show the pause screen	If the player selects enter whilst playing the game, the game will pause.		
18	Exit the game from the pause screen	If the player presses the backspace key then they will be returned to the title screen		
19	Progress to the second level	If the player's Score is 10 Alien's then the second level will begin		
20	Award the player with an extra life if they have beaten the first level	The Player's life count will increase by 1		
21	Player's beam hits the Yellow Alien	If the Player's beam hits the yellow Alien then on the first hit, the Alien will be damaged but will die on the second hit.		
22	The Yellow Alien moves down	The Yellow Alien's appears on the second screen and move down		
23	The Yellow Alien shoots a beam	The Yellow Alien's will randomly shoot a beam.		

24	The Yellow Alien's beam hits the Player	If the yellow Alien's beam hits the player, then the player's life will decrease by 1		
25	Collision test between the player and the Yellow Alien	If the Player hits/moves to the Alien, then the player's life will decrease by 1		
26	Progress to the third level	If the player's Score is 30 Alien's then the Third level will begin		
27	Award the player with an extra life if they have beaten the Second level	The Player's life count will increase by 1		
28	Player's beam hits the Red Alien	If the Player's beam hits the Red Alien then on the first hit and second hit, the Alien will be damaged but will die on the Third hit.		
29	The Red Alien moves down	The Red Alien's appear on the third level and move down		
30	The Red Alien shoots a beam	The Red Alien's will randomly shoot a beam.		

31	The Red Alien's beam hits the Player	If the Red Alien's beam hits the player, then the player's life will decrease by 1		
32	Collision test between the player and the Red Alien	If the Player hits/moves to the Alien, then the players life will decrease by 1		
33	Progress to the fourth level	If the player's Score is 40 Alien's then the fourth level will begin		
34	Award the player with an extra life if they have beaten the first level	The Player's life count will increase by 1		
35	Player's beam hits the Red Alien	If the Player's beam hits the Red Alien then on the first hit and second hit, the Alien will be damaged but will die on the Third hit.		
36	Player's beam hits the Yellow Alien	If the Player's beam hits the Yellow Alien then on the first hit the Alien will be damaged but will die on the Second hit.		

37	Player's beam hits the Green Alien	If the Player's beam hits the Green Alien then the alien will die.		
38	The Red Alien moves down	The Red Alien's appear on the fourth level and move down		
39	The Yellow Alien moves down	The Yellow Alien's appear on the fourth level and move down		
40	The Green Alien moves down	The Green Alien's appear on the fourth level and move down		
41	The Red Alien shoots a beam	The Red Alien's will randomly shoot a beam.		
42	The Yellow Alien shoots a beam	The Red Alien's will randomly shoot a beam.		
43	The Green Alien shoots a beam	The Red Alien's will randomly shoot a beam.		
44	The Red Alien's beam hits the Player	If the Red Alien's beam hits the player, then the player's life will decrease by 1		
45	The Yellow Alien's beam hits the Player	If the Yellow Alien's beam hits the player, then the player's life will decrease by 1		

46	The Green Alien's beam hits the Player	If the Green Alien's beam hits the player, then the player's life will decrease by 1		
47	Collision test between the player and the Red Alien	If the Player hits/moves to the Alien, then the players life will decrease by 1		
48	Collision test between the player and the Yellow Alien	If the Player hits/moves to the Alien, then the players life will decrease by 1		
49	Collision test between the player and the Green Alien	If the Player hits/moves to the Alien, then the players life will decrease by 1		
50	Progress to the Fifth level	If the player's Score is 50 Alien's then the fifth level will begin		
51	Award the player with an extra life if they have beaten the fourth level	The Player's life count will increase by 1		
52	Player's beam hits the Boss Alien	If the Player's beam hits the Boss Alien then a part of its HP will deplete.		
53	The Boss Alien moves down	The Boss Alien appears on the screen and move down		

54	The Boss Alien shoots two beams	The Boss Alien will randomly shoot two beams at once.		
55	The Boss Alien's beam hits the Player	If the Boss Alien's beam hits the player, then the player's life will decrease by 1		
56	Collision test between the player and the Boss Alien	If the Player hits/moves to the Alien, then the player's life will decrease by 1		
57	The Boss Alien's HP Bar is revealed	Once the fifth level starts, the HP bar of the boss Alien is shown on the screen		
58	decrease the boss Alien's HP Bar	If the player hits the boss Alien then the HP bar of the boss will have a portion of it decrease.		
59	Progress to the ending of the game	If the player has defeated the boss Alien then the ending of the game will play		
60	show the ending screen of the game	The ending scene of the game will play		

61	show the final ranking of the game	Show the player's overall ranking of the game, such as the score achieved, lives saved and enemies defeated.		
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