Unity Games Development Workshop

Starting Development

https://github.com/KyleHammer/ProjectBeachDay

Clone/Download the Project

https://github.com/KyleHammer/ProjectBeachDay

What are we doing today?

Designing level layouts

Balancing the game

Programming

Bug Fixing

And most importantly, learning new skills!

Brief:

A roguelike that is about to be released for early access, however the game is still contains some obvious bugs and does not feel good to play.

It’s up to you to polish up the game and add your own spin to it!

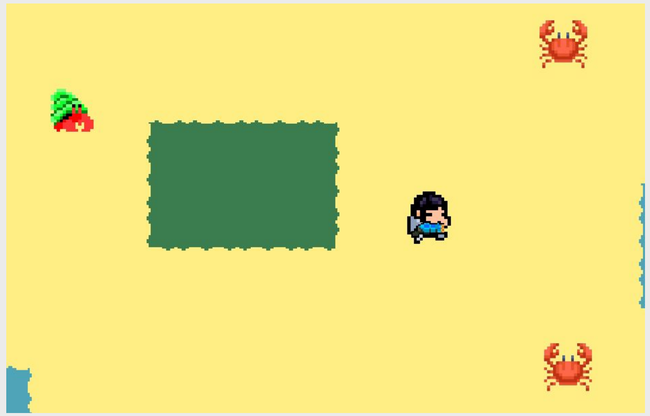
Controls

WASD – Movement
Space – Dash
Left Mouse – Shoot (Very Bugged)

Hold R – Restart
Esc – Quit Game

Game Progression

Player clears room of enemies



Player gets stat upgrade

Player selects next room reward

…Or at least that is how it should work

Example End Product

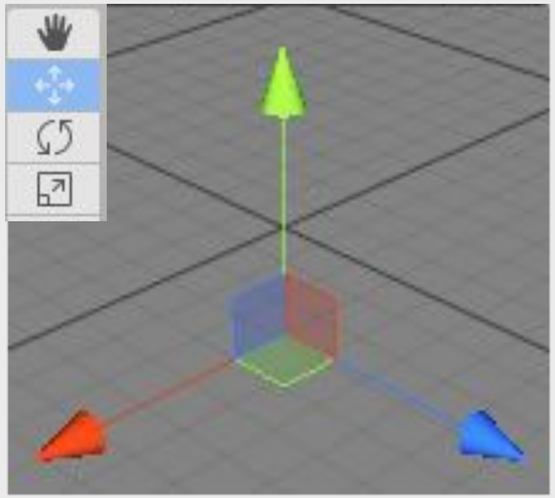
Navigating the Game Engine

Tool Tip!
Top Left Icons

Q
W
E
R
T
Y

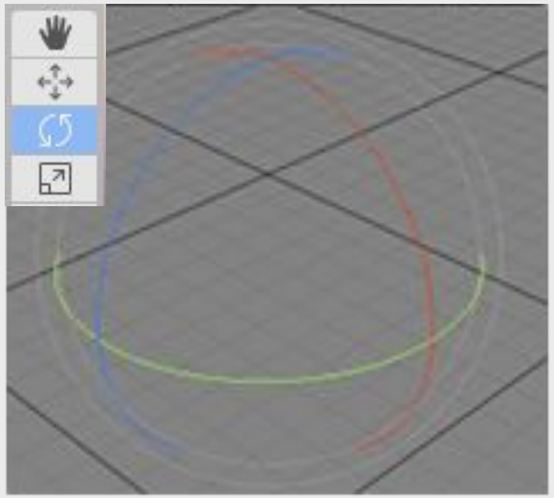
Use these tools to customize your objects in game

Tool Tip!
Icons on the top left



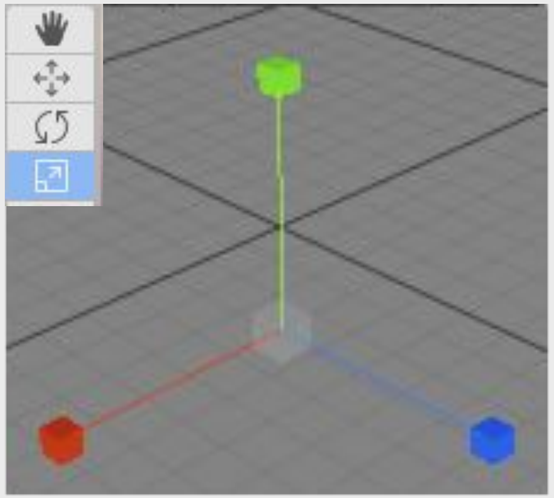
MOVE OBJECT

[w]



ROTATE OBJECT

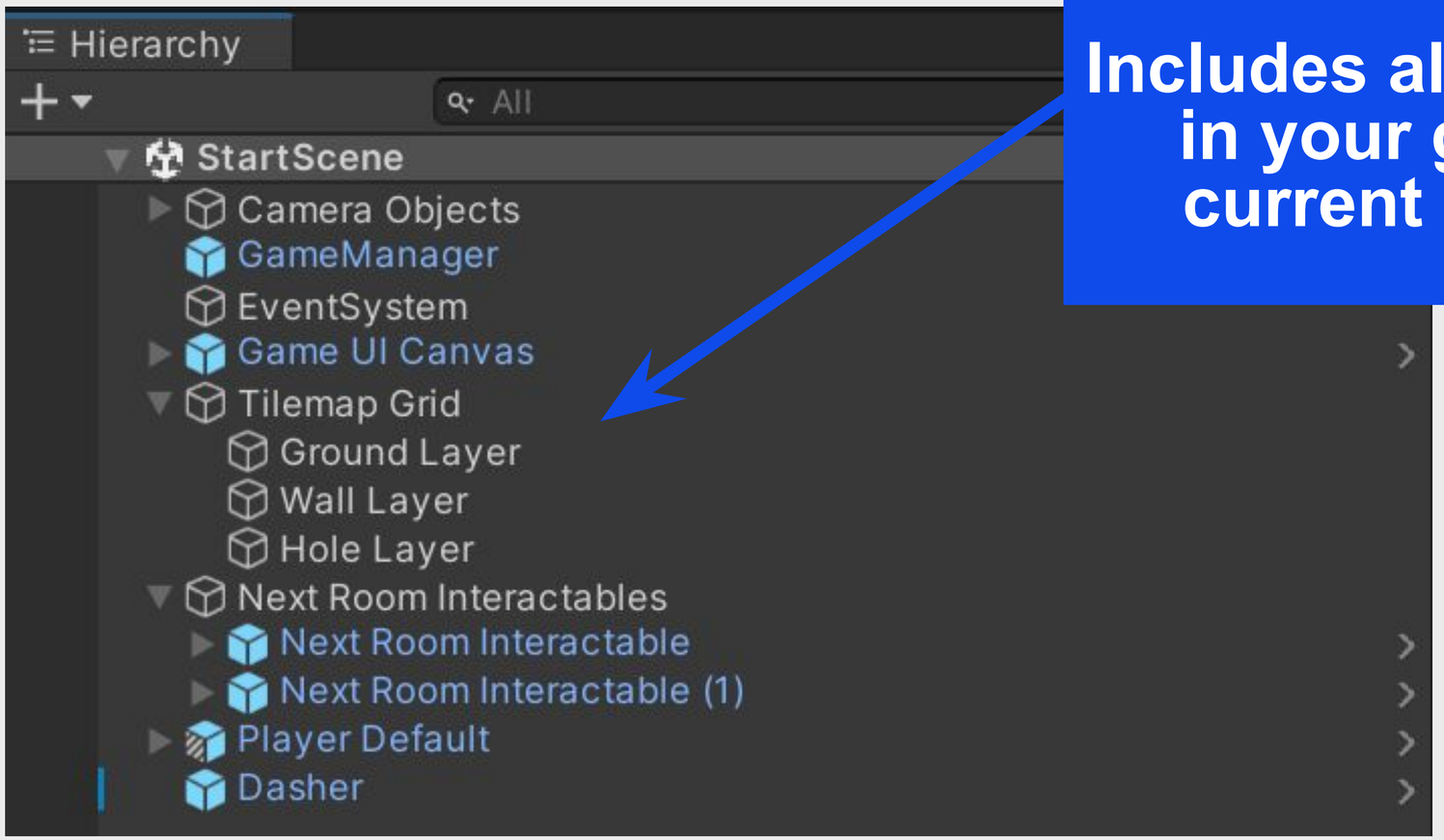
[e]



SCALE OBJECT

[r]

Tool Tip!
Hierarchy



Includes all GameObjects in your game (in the current level/scene)

Tool Tip!
Inspector

Includes all things related to the object

Inspector | Navigation

Player Default — Static

Tag: Player — Layer: Player

Variant: Open | Select | Overrides

Transform

Position	X 0	Y 0	Z 0
Rotation	X 0	Y 0	Z 0
Scale	X 2	Y 2	Z 1

Sprite Renderer

Animator

Rigidbody 2D

Capsule Collider 2D

Edit Collider

Material: None (Physics Material 2D)

Is Trigger

Used By Effector

Offset: X 0 Y 0

Size: X 0.27 Y 0.4

Direction: Vertical

Info

Audio Source

Audio Source

Audio Source

Audio Source

Player Input

Player Controller (Script)

Script: PlayerController

Player Stats

Current Stats: CurrentPlayerStatsObject (Player Stats Object)

Rb: Player Default (Rigidbody 2D)

Animator: Player Default (Animator)

Sprite: Player Default (Sprite Renderer)

Dash Speed: 15

Trail Renderers: 3

Sound Effects

Dash SFX: Player Default (Audio Source)

Walk SFX: Player Default (Audio Source)

Player Health (Script)

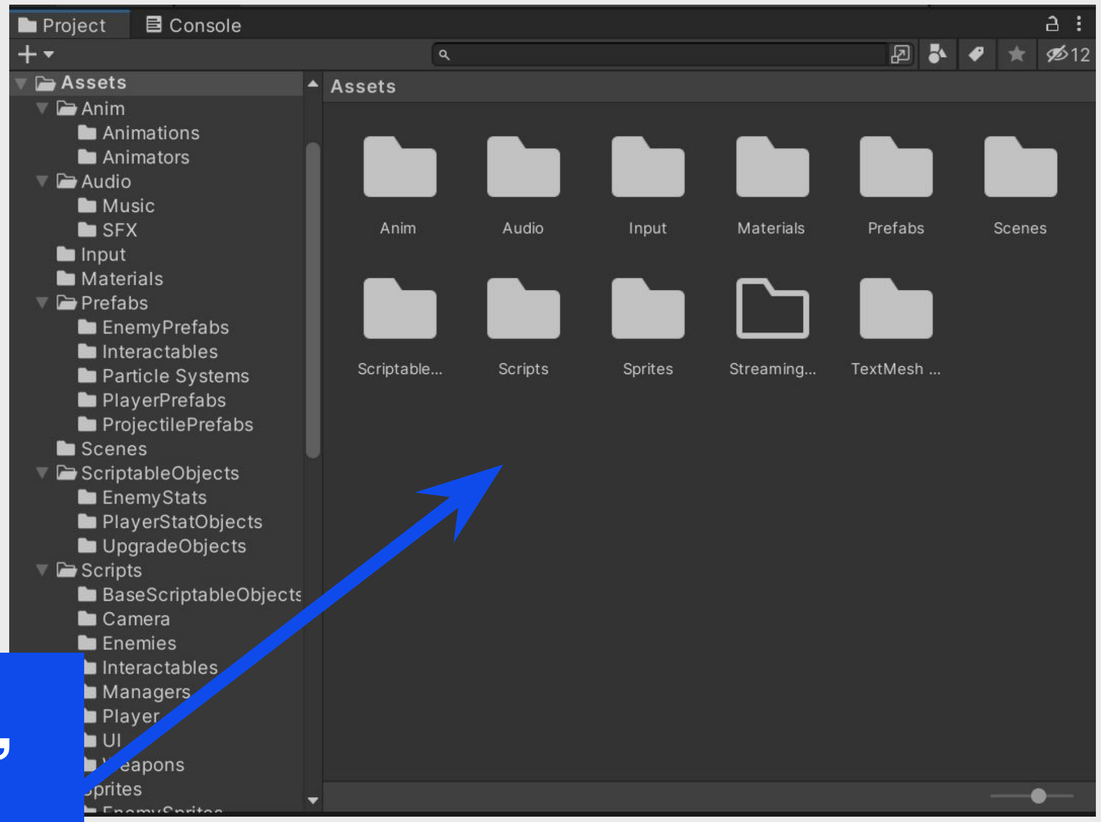
Player Upgrades (Script)

Sprites-Default (Material)

Shader: Sprites/Default — Edit...

Add Component

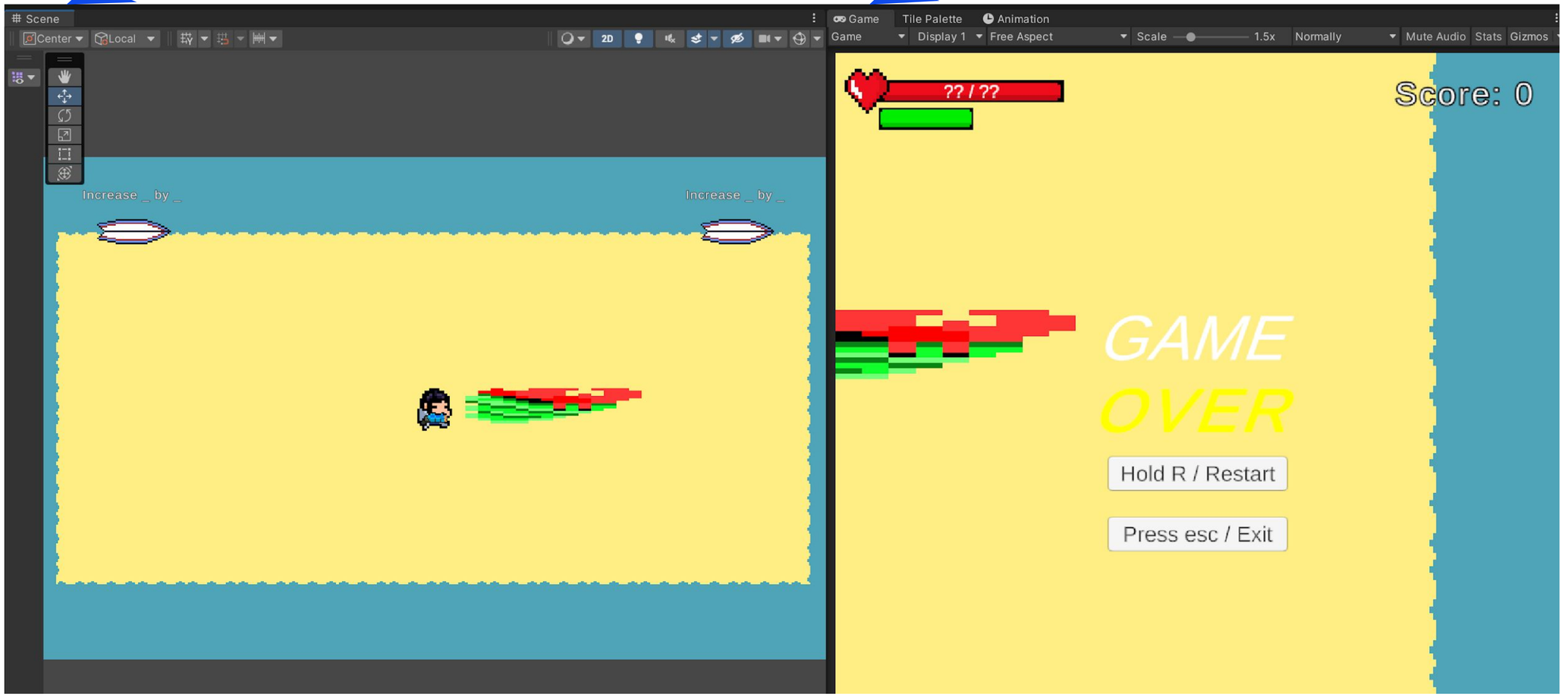
Tool Tip!
Project Window - Folders and Assets



Includes scripts, music, characters and level design objects

Move objects around in the Scene Tab

Test your game in the Game Tab



Tool Tip!
Middle Icons

Turn it off before editing!

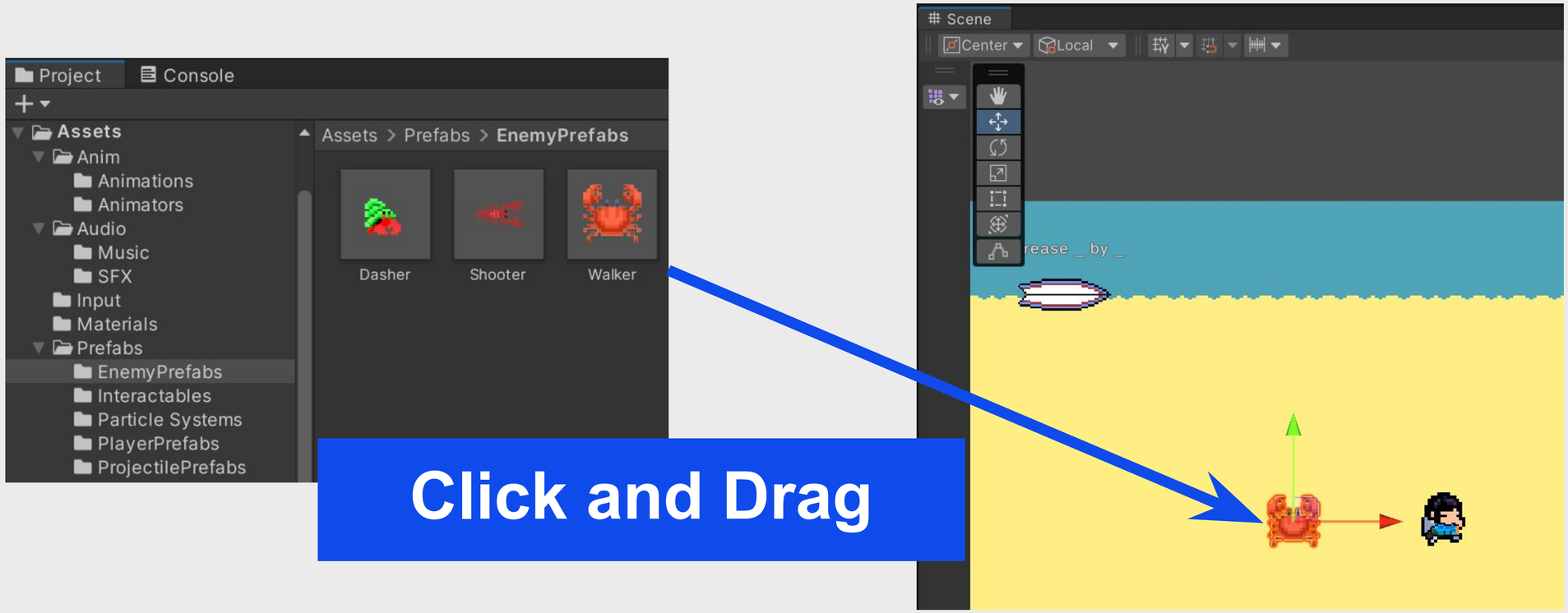
Click ‘Play’ to test the game

First task! Fixing the Hermit Crab

Step 1. Identify what is wrong with this guy

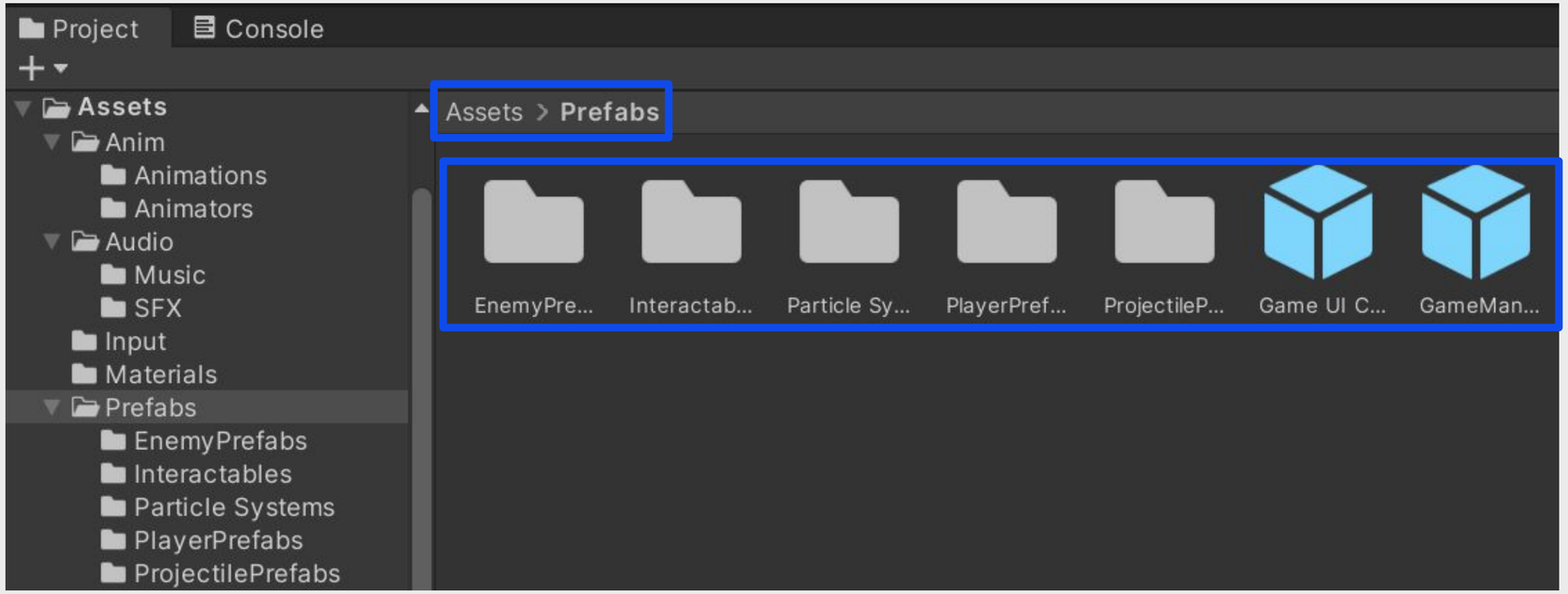
Step 2. Use your knowledge of tools to fix him up

Getting stuck? Ask questions
(to each other and to me)



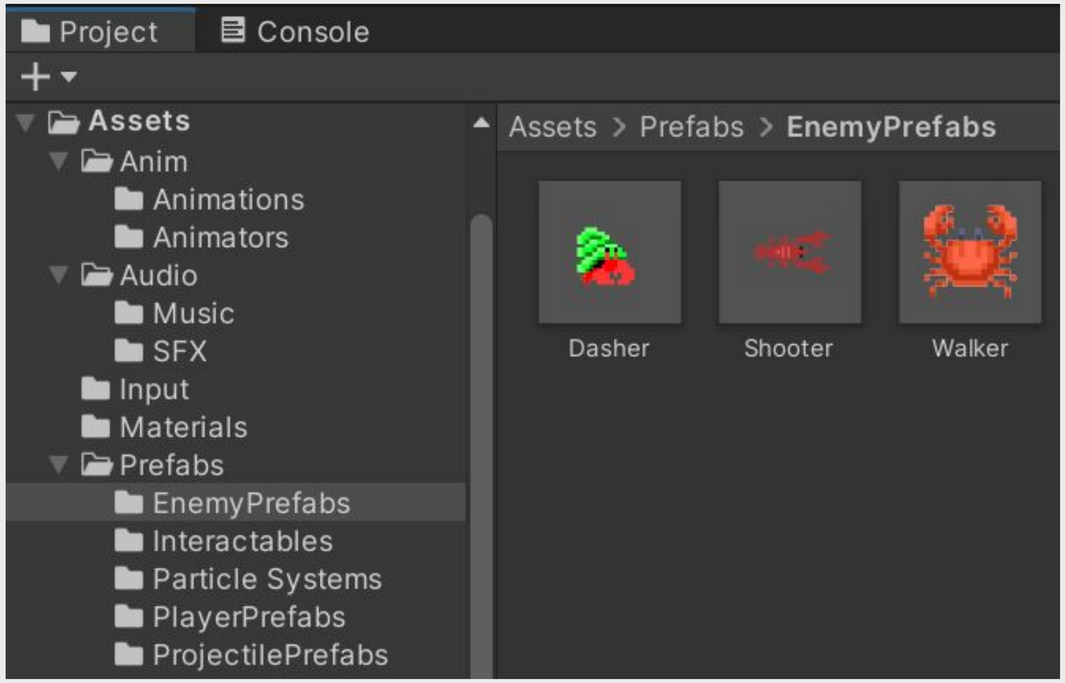
Too easy? Try making a more interesting level by adding more enemies

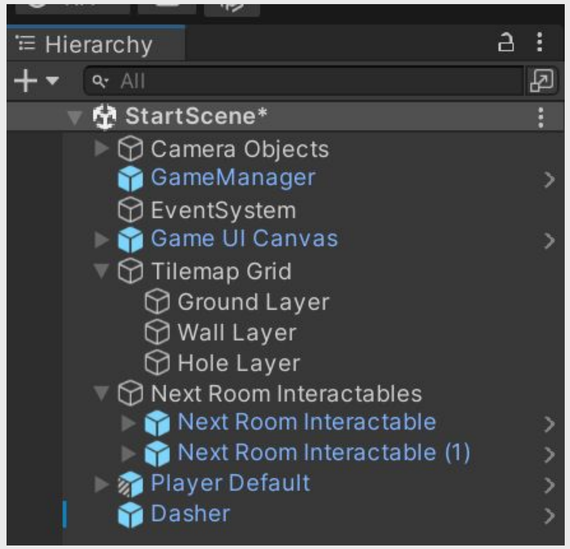
Let’s talk Prefabs



Prefabs

GameObjects that have been saved for reuse (you actually have added some prefabs in your scene already)



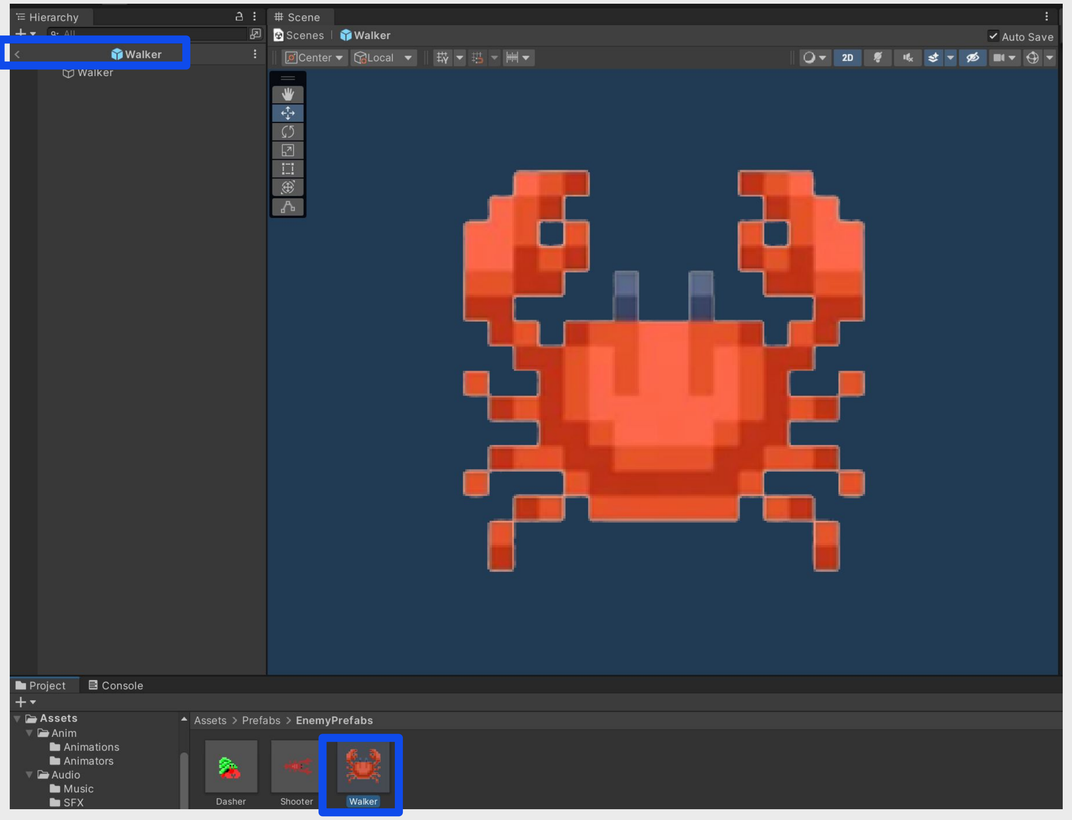


Prefabs have a blue icon and text

Prefabs

Double click a prefab in the project window to open it up in it’s own scene

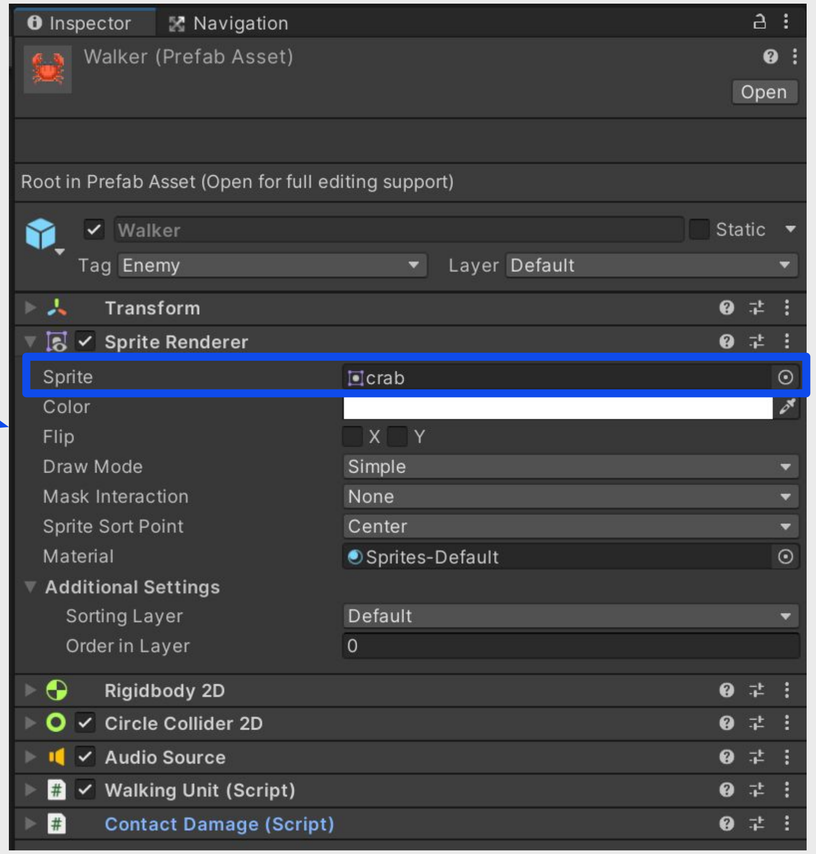
Return back to the level scene



Prefabs

Useful for making changes to all of the same GameObjects in the scene

Project Window

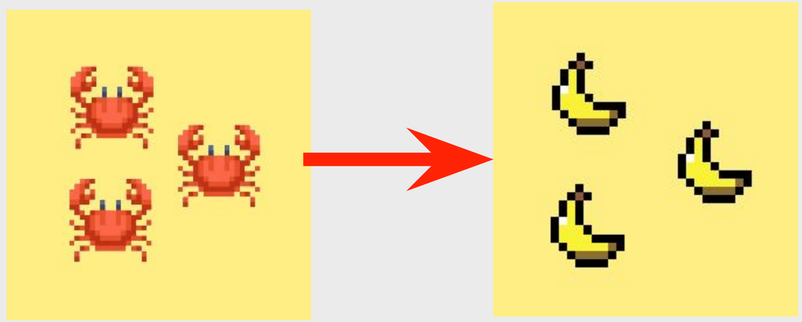


E.g. We can change the sprite in the prefab to turn all

Crab Walkers

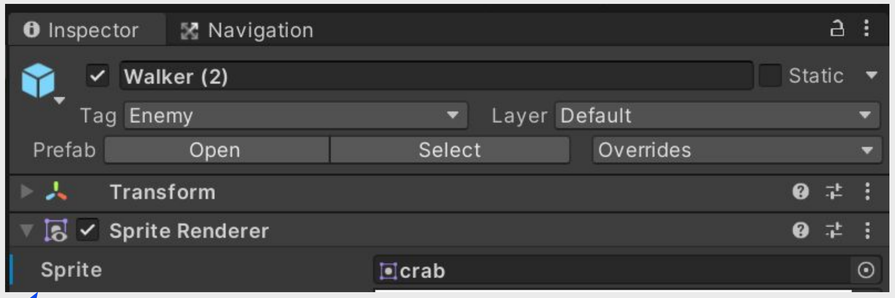
Into

Banana Walkers



Prefabs

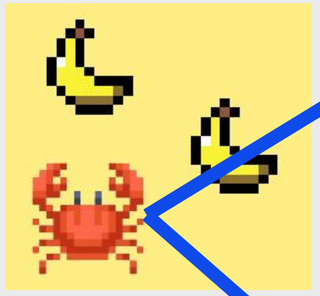
HOWEVER, these changes will be overridden if we have modified the prefab in the scene

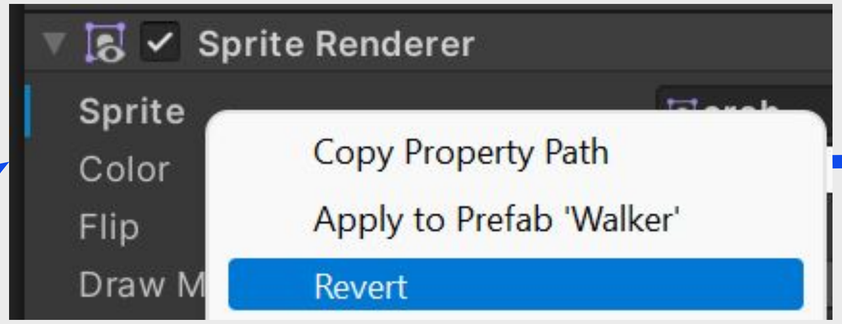


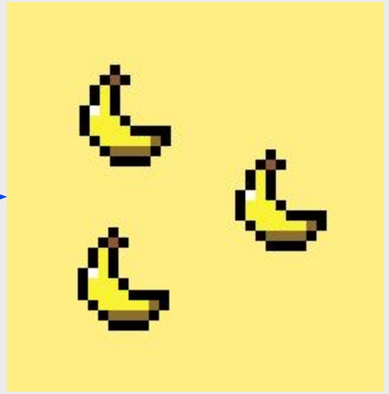
The small blue line shows that the prefab has been changed in the scene. Crab is Walker (2)

Prefabs

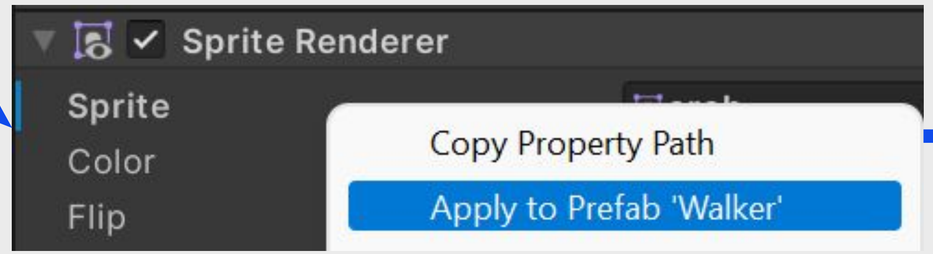
You can revert the prefab attribute back to it's prefab state by right clicking and selecting Revert

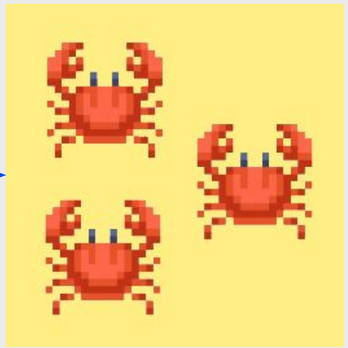






Alternatively, you can also Apply the change to the prefab to affect every other prefab of the same type

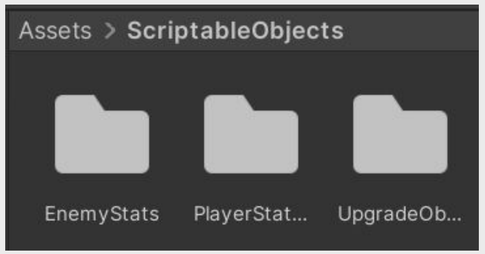


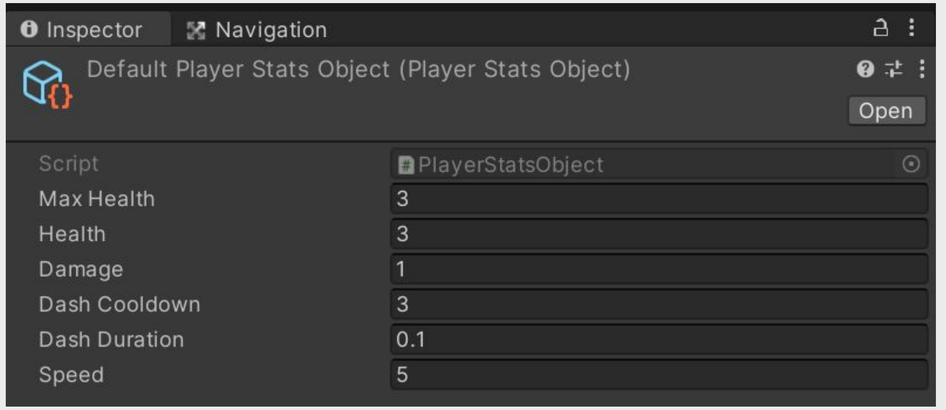


What scenarios (other than enemies) might prefabs be useful?

Scriptable Objects

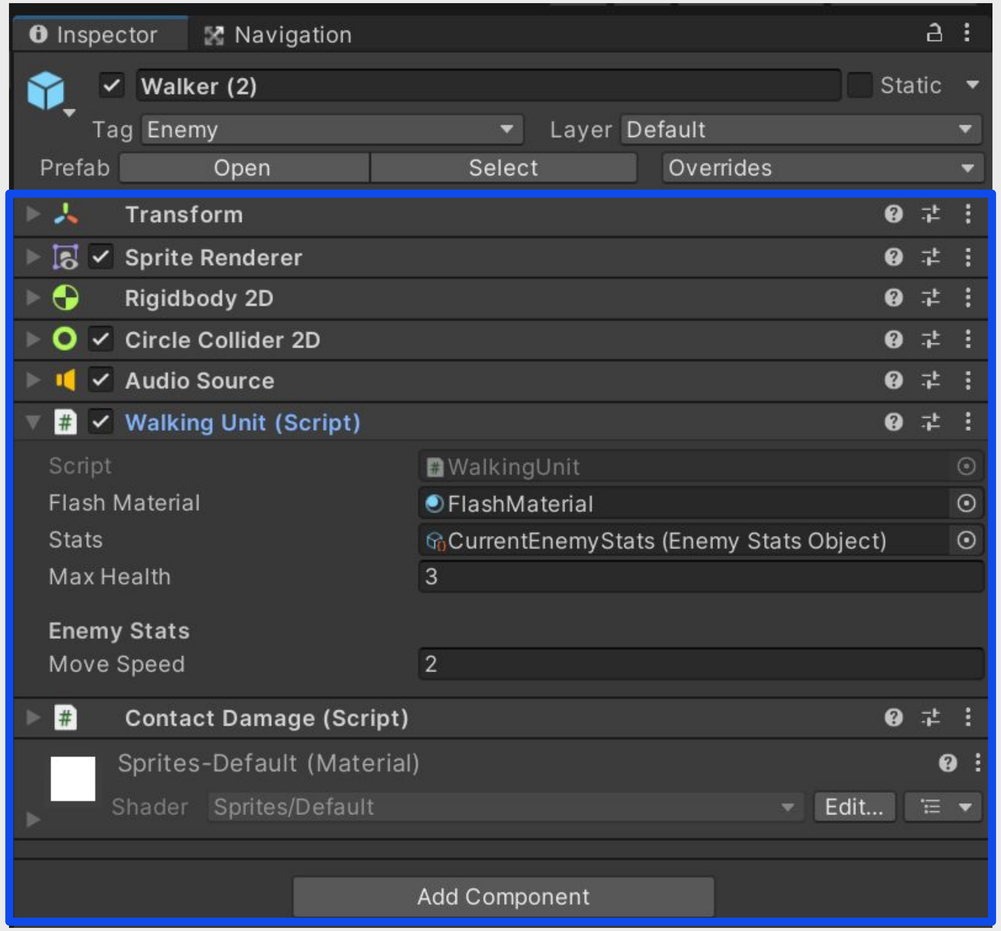
Simple version of prefabs. They hold data only





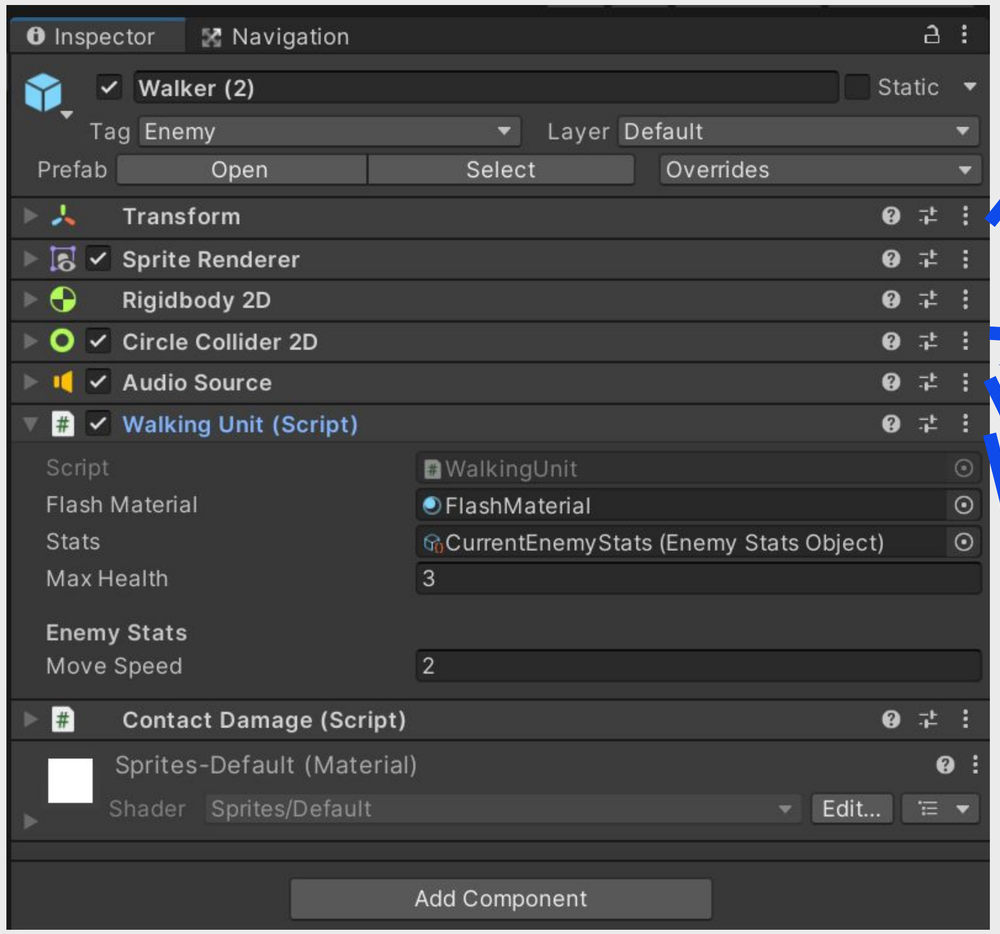
Scriptable objects save even during play mode. Useful for storing changing game data (E.g. player stats upgrading)

Let’s talk Components



Components

Attachments to GameObjects. Components are the added properties to GameObjects



Transform sets position, rotation and scale

Circle collider gives the enemy a hitbox+hurtbox

AudioSource can be played for a sound effect

WalkingUnit is a custom script with simple AI

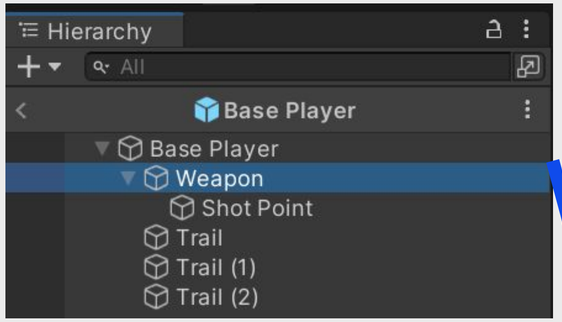
Second task! Modifying stats

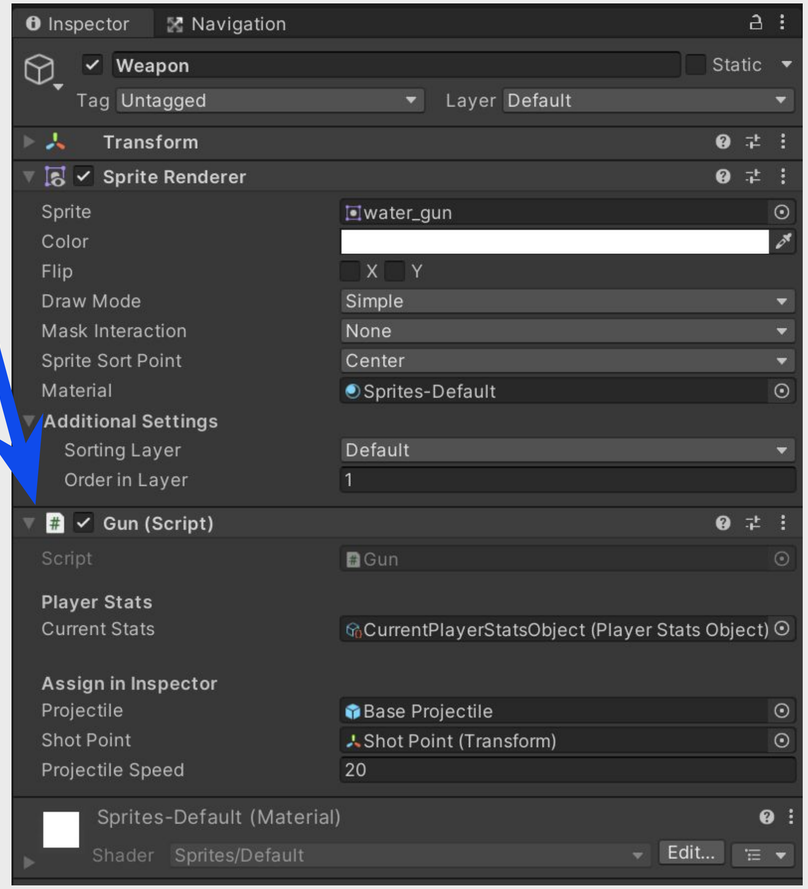
- **Modify your enemy's starting stats (e.g., Damage, speed and HP)** Saved on the enemy prefabs
- **Modify the default player stats** Saved in scriptable objects
- **How do you modify the stats? Use your knowledge of Prefabs and Components to find out**
- **Strike a good difficulty balance. Have someone test out the game**

Third Task. Lets finally look at fixing the gun implementation!

Coding

- Start by finding the player prefab
- Locate the “Weapon” on the player character





Right click Gun (Script) and hit Edit Script

Switch to Visual Studio Code (Should be installed). This process usually takes a bit

Ask for help if needed

```
1 asset usage  2 usages  Kyle [Home PC] +1 *
public class Gun : MonoBehaviour
{
    [Header("Player Stats")]
    [SerializeField] private PlayerStatsObject currentStats;  CurrentPlayerStatsObject.asset
    [Space]

    [Header("Assign in Inspector")]
    [SerializeField] private GameObject projectile;  Base Projectile
    [SerializeField] private Transform shotPoint;  Shot Point (Transform)

    [SerializeField] private float projectileSpeed = 20;  Unchanged

    private SpriteRenderer sr;

    Event function  KyleHammerGitHub
    private void Start()
    {
        sr = GetComponent<SpriteRenderer>();
    }

    Event function  KyleHammerGitHub +1
    private void Update()
    {
        SetGunDirection();
        SetSpriteDirection();
    }

    1 usage  Kyle [Home PC] +1 *
    public void Shoot()
    {
        GameObject newProjectile = Instantiate(projectile, shotPoint.position, shotPoint.rotation);
        Debug.Log( message: "Bang");

        // TODO: Implement bullet movement

        // Set the projectile velocity

        // Set the projectile damage
    }

    Frequently called  1 usage  Kyle [Home PC] *
    private void SetGunDirection()
    {
        // TODO: Implement gun rotation

        // Find the mouse position on the screen

        // Get the position of the gun

        // Get the direction the bullet needs to go (end point - start point)

        // Set the gun transform's right side to the direction
        // This is because the gun faces right by default

    }
```

Don’t be too overwhelmed, we won’t be going over everything about coding. Just a couple essentials

Variables:

Like a noun. They store a thing…

- projectile is a GameObject that stores our bullet
- currentStats is a PlayerStatsObject that stores the player stats
- projectileSpeed is a float (decimal number) that determines the bullet velocity

```
1 asset usage  2 usages  Kyle [Home PC] +1 *
public class Gun : MonoBehaviour
{
    [Header("Player Stats")]
    [SerializeField] private PlayerStatsObject currentStats;  CurrentPlayerStatsObject.asset
    [Space]

    [Header("Assign in Inspector")]
    [SerializeField] private GameObject projectile;  Base Projectile
    [SerializeField] private Transform shotPoint;  Shot Point (Transform)

    [SerializeField] private float projectileSpeed = 20;  Unchanged

    private SpriteRenderer sr;
```

It helps to name variables something suitable to their task

Functions:

Like a verb. They are responsible for doing something upon request…

- **Start() is performed on the first frame of the level**
- **Update() is performed every frame**
- **SetGunDirection() is performed every time Update() is run**

```
Event function  KyleHammerGitHub
private void Start()
{
    sr = GetComponent<SpriteRenderer>();
}

Event function  KyleHammerGitHub +1
private void Update()
{
    SetGunDirection();
    SetSpriteDirection();
}

1 usage  Kyle [Home PC] +1 *
public void Shoot()
```

When might we want to use Start() and Update() in a game?

Modify the Shoot() function

```
public void Shoot()
{
        if (!canShoot) return;

        canShoot = false;
        currentCooldown = fireRateCooldown;

        GameObject newProjectile = Instantiate(projectile, shotPoint.position, shotPoint.rotation);

        // TODO: Implement bullet movement

        // Set the projectile velocity
        newProjectile.GetComponent<Rigidbody2D>().velocity = transform.right * projectileSpeed;

        // Set the projectile damage
        newProjectile.GetComponent<Projectile>().SetDamage(currentStats.damage);
}
```

//
Is a comment. It is simply text used to help the programmer understand what the task is. It does not run

Insert the blue lines into your Gun script

Modify SetGunDirection()

```
private void SetGunDirection()
{
        // TODO: Implement gun rotation

        // Find the mouse position on the screen
        Vector2 mousePosition = Camera.main.ScreenToWorldPoint(Mouse.current.position.ReadValue());

        // Get the position of the gun
        Vector2 weaponPosition = transform.position;

        // Get the direction the bullet needs to go (end point - start point)
        Vector2 direction = mousePosition - weaponPosition;

        // Set the gun transform's right side to the direction
        // This is because the gun faces right by default
        transform.right = direction;
}
```

Coding can be difficult, especially with such little time. So don’t feel too bad if you don’t understand what is going on and directly copy instead

Test it out in play mode. Did it work?

Don’t feel discouraged if it doesn’t

Most programmers never get it right on the first go anyway!

Operator Cheat Sheet

; // The "Full Stop" of coding, ends every **command*** *but not comparison
a = b; // Set the value of a to the value of b
b = a; // Set the value of b to the value of a

```
If (Criteria is met)
{
        Do this task;
}
```

a++; // Make a equal it's value + 1
b--; // Make b equal it's value – 1
a += 10 // Make a equal it's value + 10
a = b + 10; // Make a equal b + 10

If (a > b) {} // Compare if the value of a is **larger than** b
If (a == b) {} // Compare if the value of a is **the same value** as b
If (a >= b) {} // Compare if the value of a **larger than or is same value** as b

// Compare if a **is the same value** as b **AND** b **is larger than** c
If (a == b && b > c) {}

// Compare if a **is the same value** as b **OR** b **is larger than** c
If (a == b || b > c) {} // | is the symbol above the enter key while holding shift

How does && and || differ from each other?

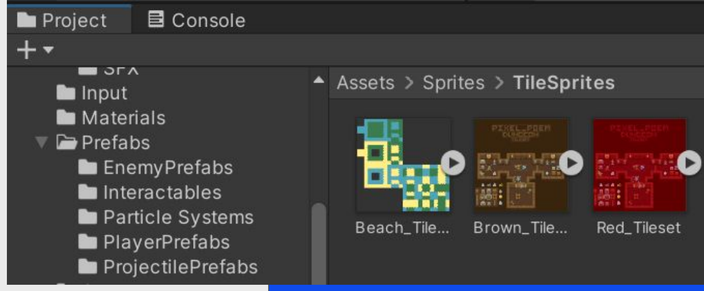
Let's move onto something more fun, level designing!

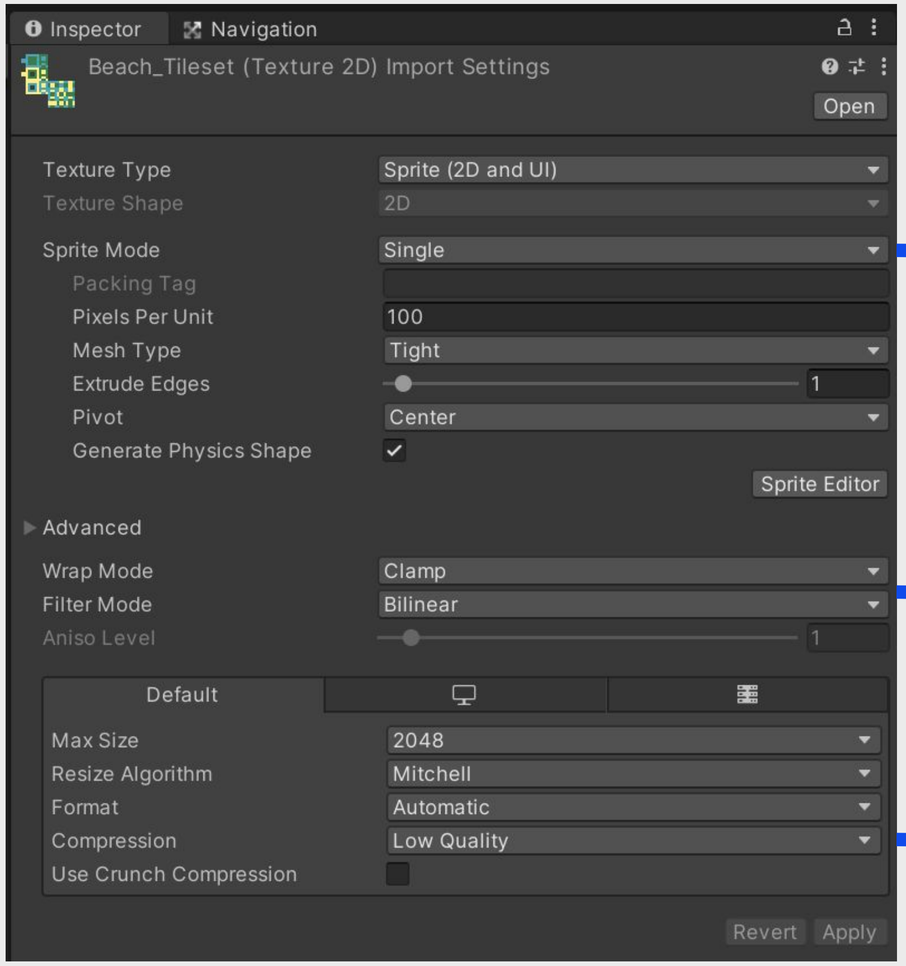
Task Four – Level Designing

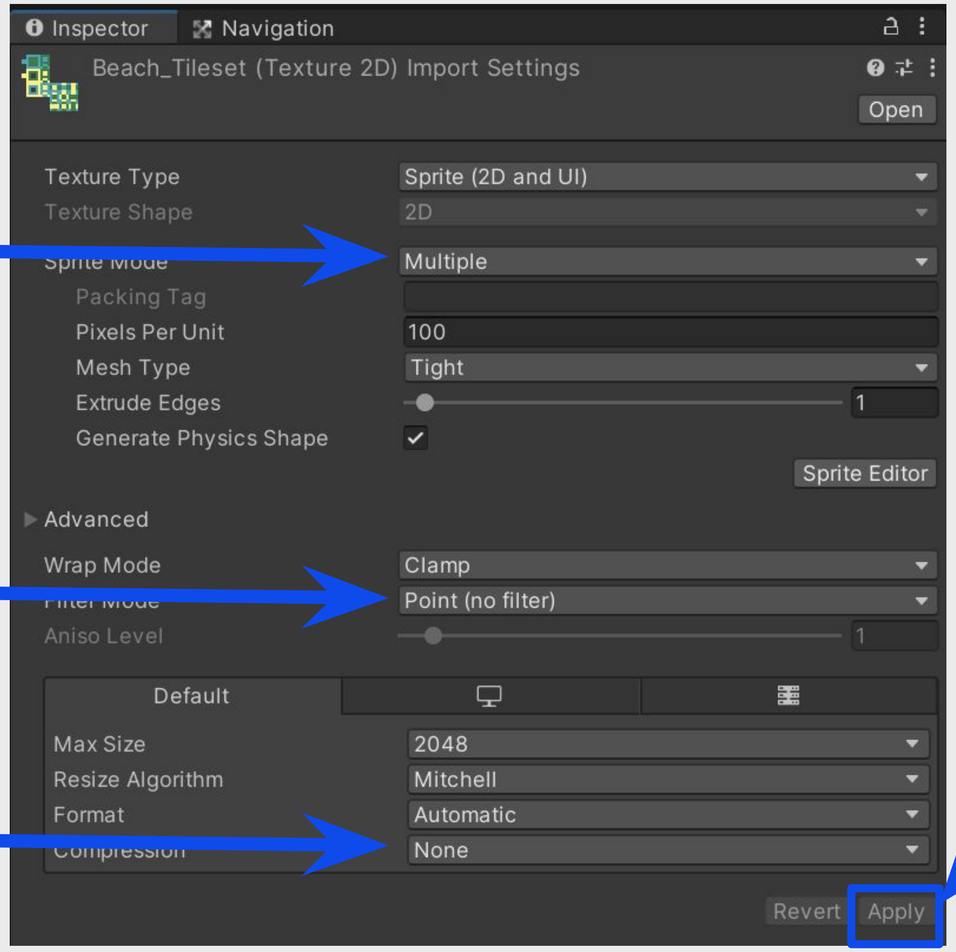
We need tiles to paint with, so lets look into splitting a sprite sheet

Importing Textures

Locate the Beach_Tileset in the sprites folder, select it and make the following changes



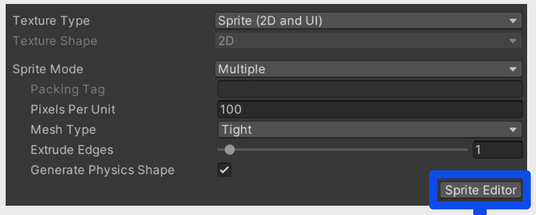


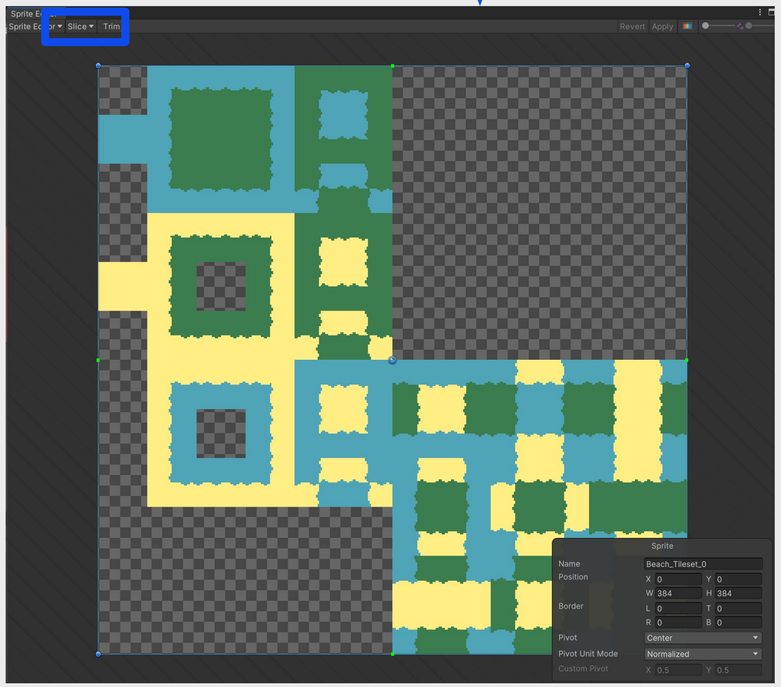


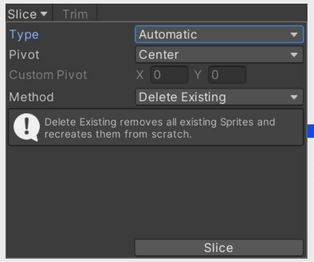
Hit apply when you're done!

Slicing Textures

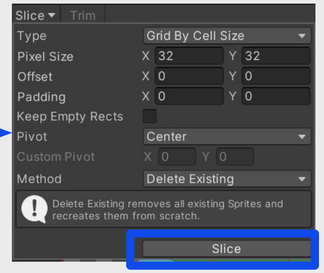
Next select the sprite editor so we can slice up the image

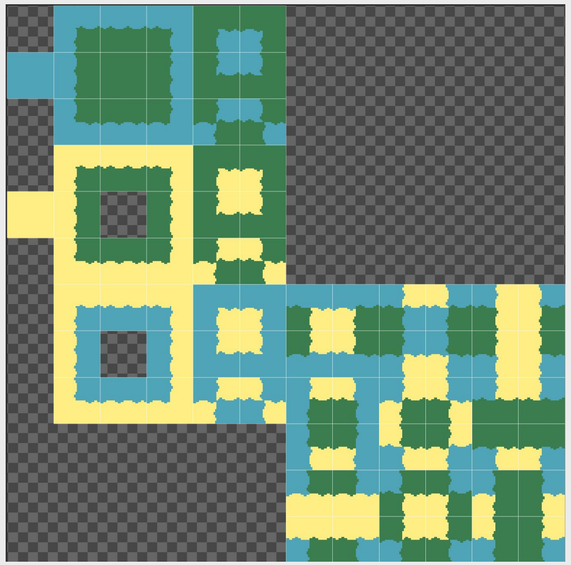




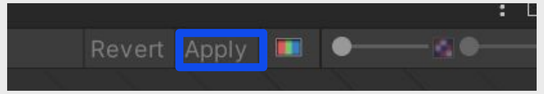


Change to Grid by Cell Size. Each cell/tile is 32px by 32px in this image





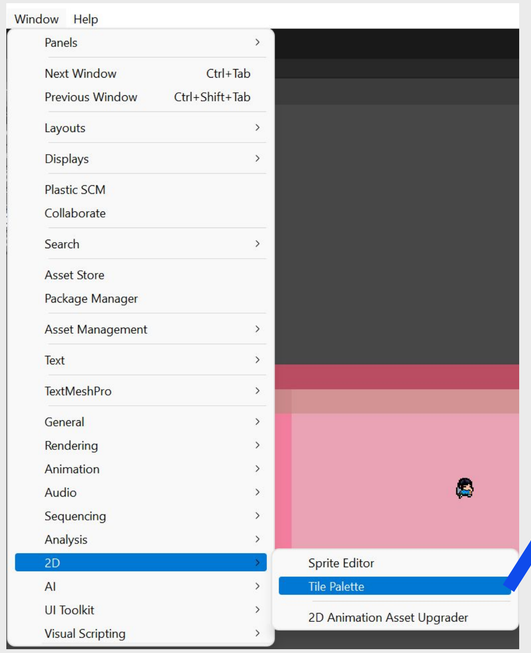
The result

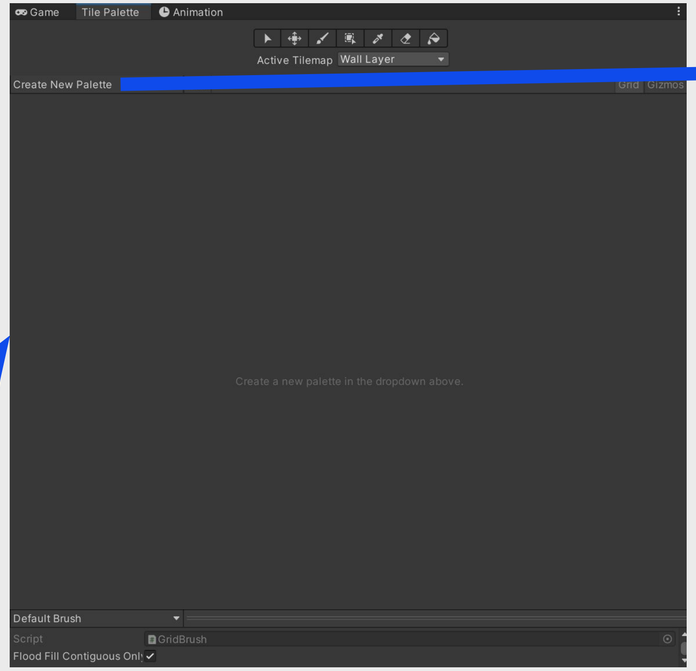


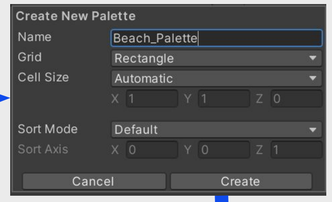
Hit apply when you're done!

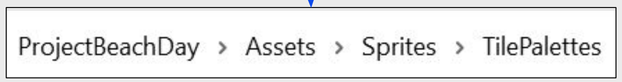
Making a Palette

Let turn these textures into a palette we can paint levels with





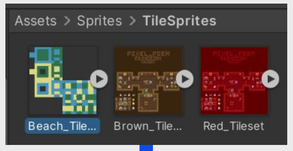




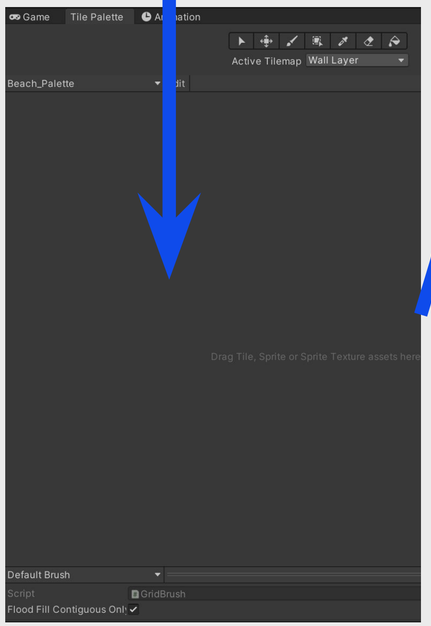
Save it in this location

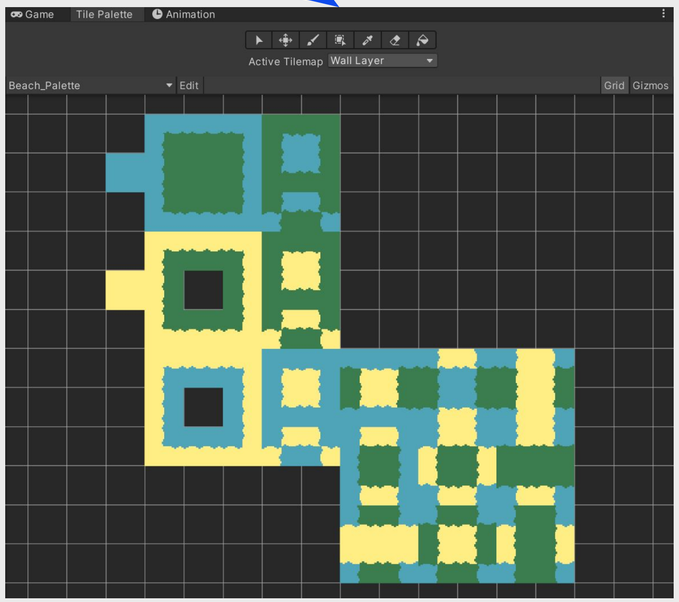
Making a Palette

Drag and drop our textures in the project window into the palette window



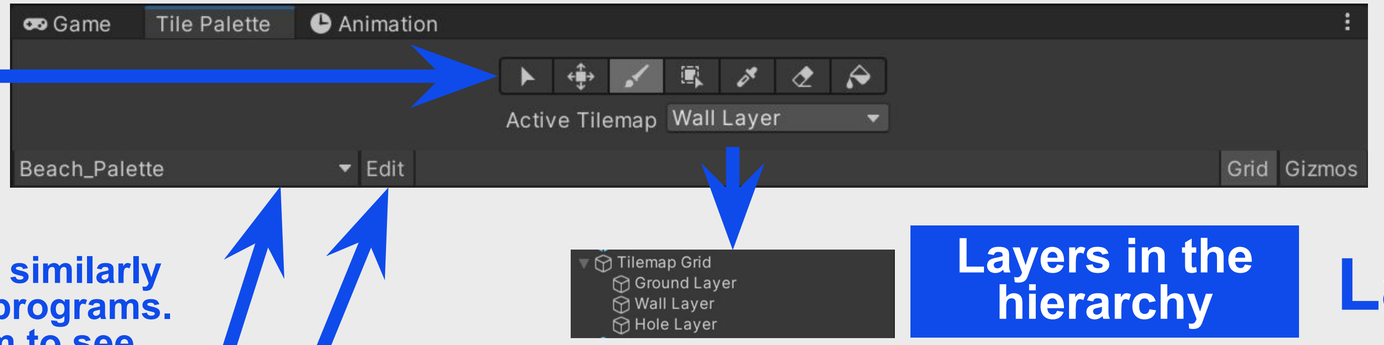
A tile will be generated for each texture. Create a folder called “Beach_Tiles” and save it there





This is what the end result should look like!

Palette painting tips



These tools work similarly to other painting programs. Hover over them to see what they do

Colour picker, brush and eraser are probably the most useful

Change the palette your using if you have multiple palettes

Used to “Edit” the tile palette. Useful for making changes to the palette like removing or moving tiles within the palette.

Layers in the hierarchy

Layers!

It’s important to make sure you are painting on the correct layer (that way you’re not painting walls on the floor layer for example)

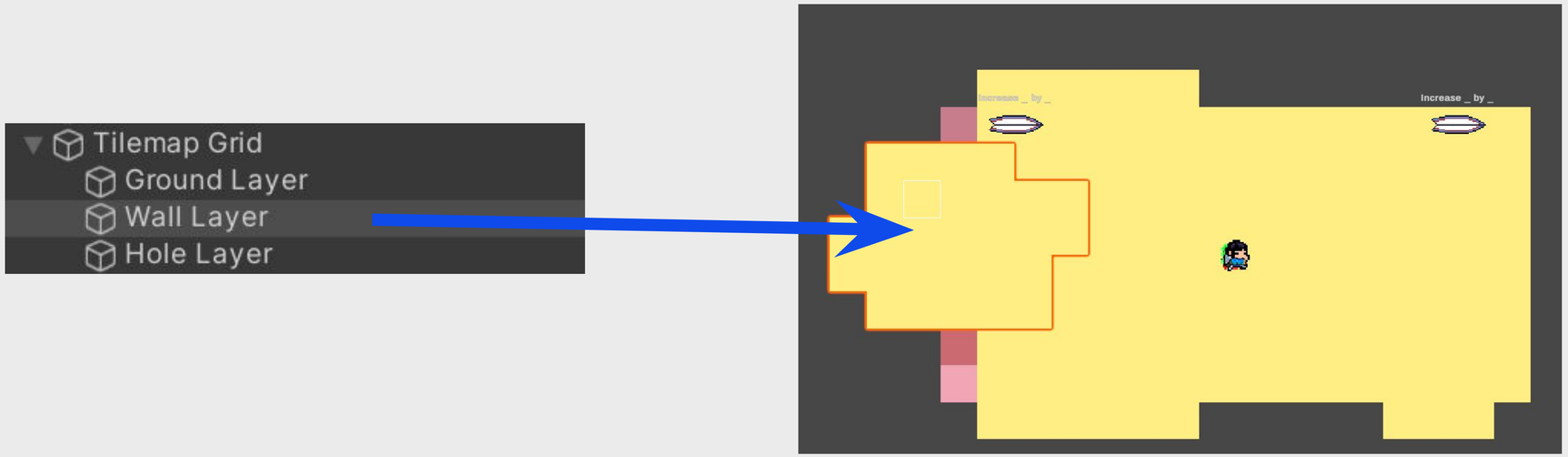
We currently have 3 layers specified

Ground layer: Area where the player and enemies can walk

Wall layer: Area that blocks the player, enemies and projectiles

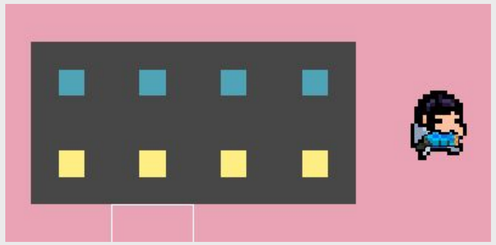
Hole layer: Area that blocks the player, enemies but not projectiles (think like a hole in the ground)

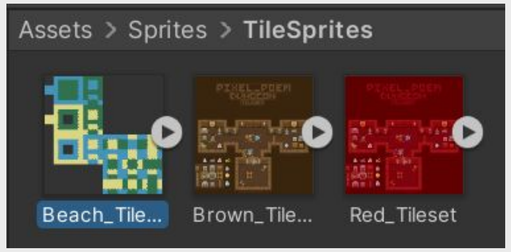
You can select the layer in the hierarchy window to see what tiles are on what layer



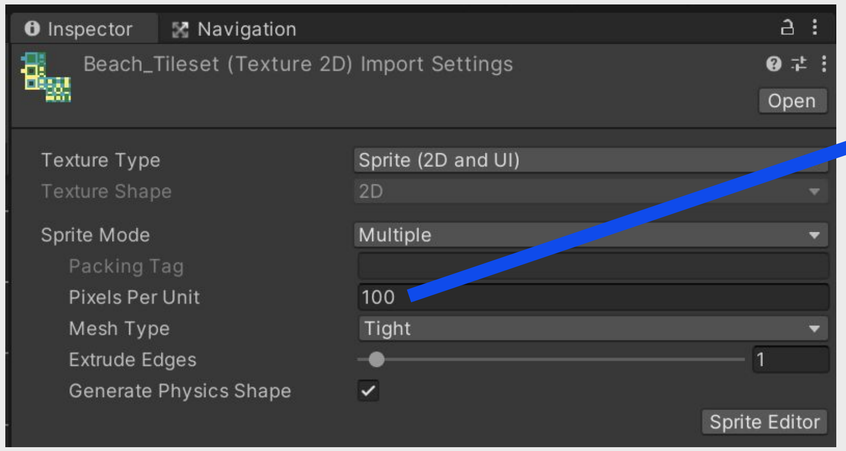
Wrong sized tiles?

Our tiles too small. Let’s fix that





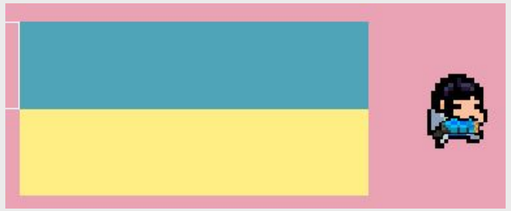
Project Window



Inspector Window

Change to 32

Don’t forget to hit apply!



Full tiles!

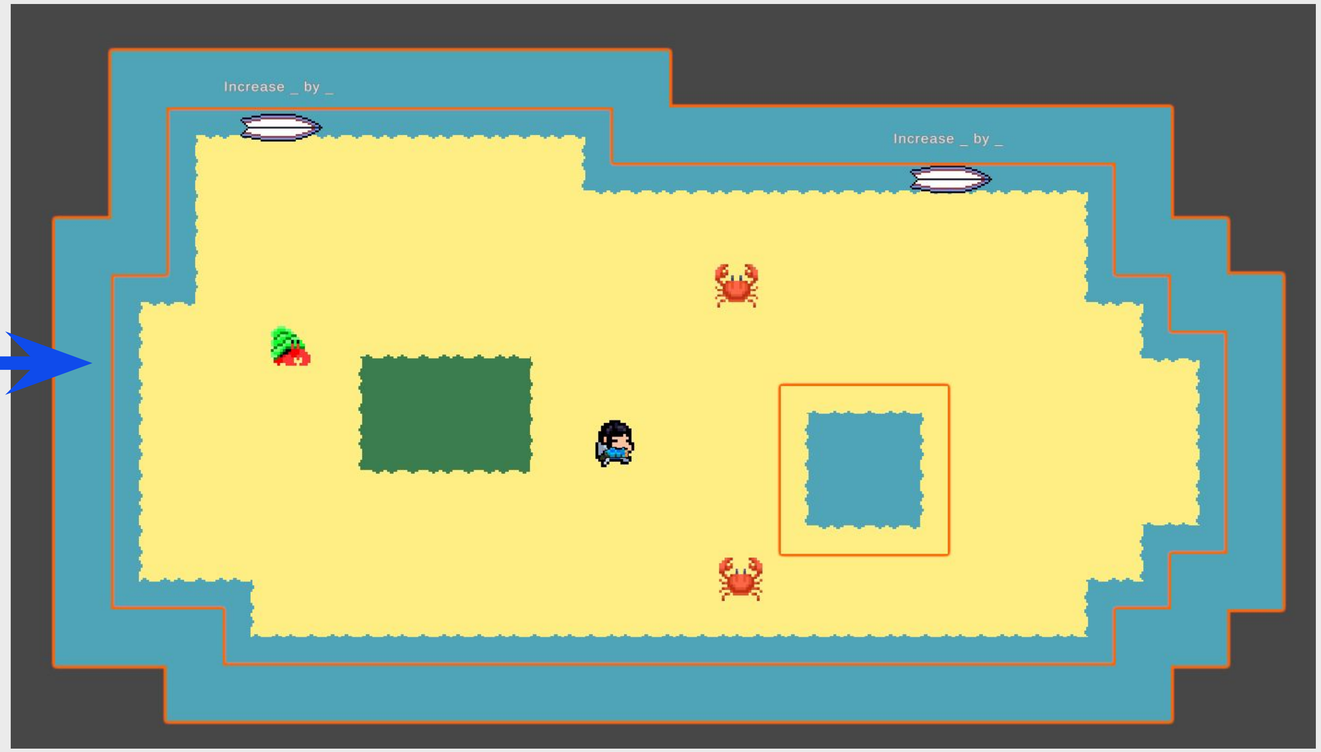
Let’s start building some levels now!

Go to your scenes folder and double click “StartScene”

Design the game’s first level!

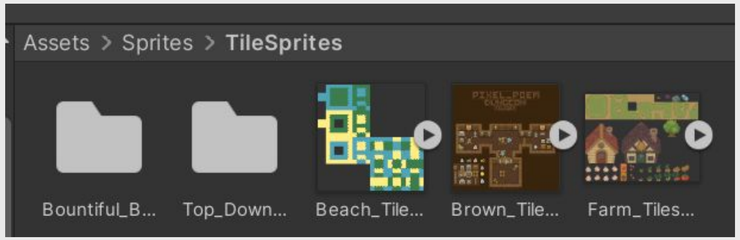
Make it fairly easy for the player, it is the first level after all. Make sure to place walls/holes.

Don’t forget to place enemies.

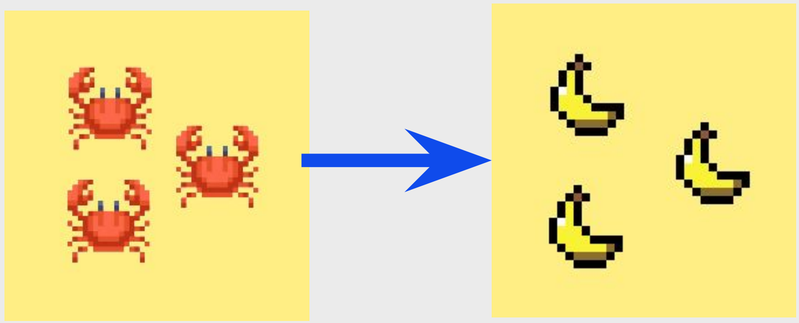


There’s more tiles!

Need more tile variety? There’s more sprite sheets available in the project

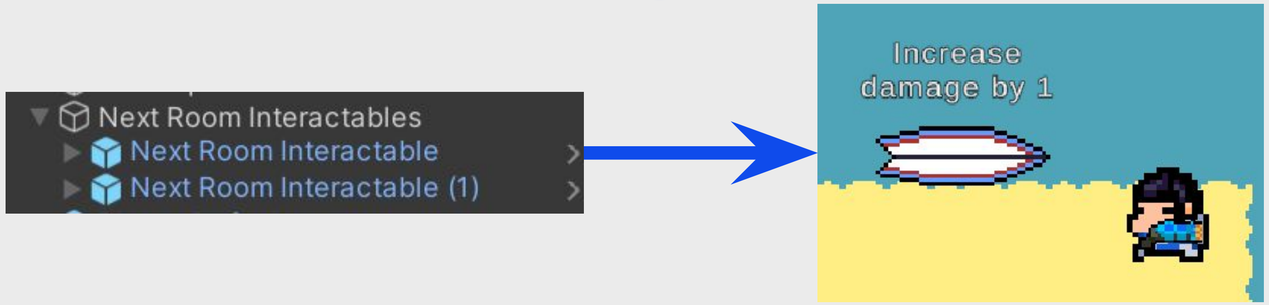


Or download your own sprite sheets online and add them to the project (simply copy the files into the project)!



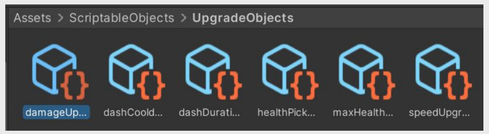
You can also import new sprites too, if you’re looking for more enemy textures

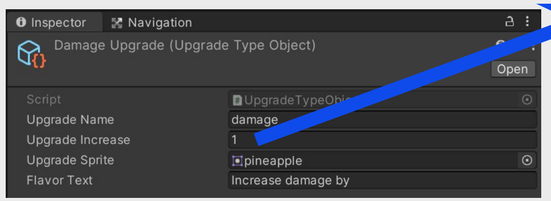
Remember the progression mechanics?



Each surfboard (Next Room Interactable) gives the player access to new levels. Feel free to move their spawn position or add even more Next Room Interactables if you wish

Room Rewards

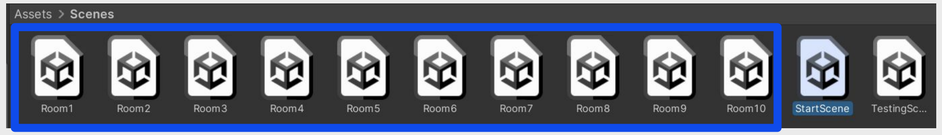




Feel free to modify the existing room reward increase

Adding more room rewards is a bit more tricky, so feel free to ask for help

Once you're done, move onto designing more rooms!

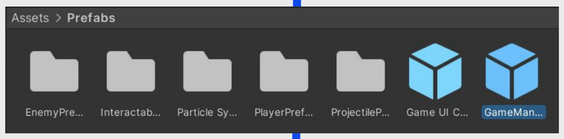


Too many rooms?

Select the room to be deleted and hit the delete key. A confirmation prompt will also appear

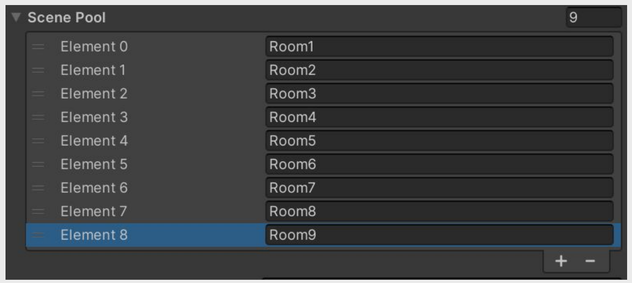
Not enough rooms?

Copy paste a scene and give it an appropriate name. Then modify that scene to your liking



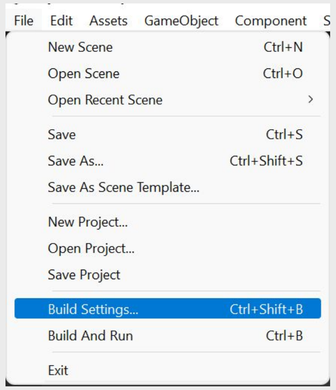
Modify the game manager prefab

In the inspector, select the scene you removed and hit the – (minus) button

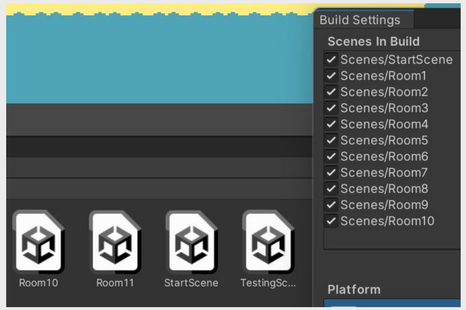


In the inspector, hit the + and type in the name of your newly added scene

After doing the above, go to File > Build Settings



If you want to remove scenes, right click the scene to be removed in the build settings and “Remove Selection”

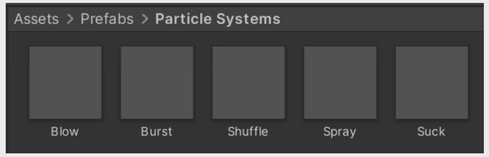


If you have new scenes, click and drag them from the project window to the “Scenes In Build”

Challenges and Extras

Particle Systems

Really make your effects shine with particles (Some programming may be involved)



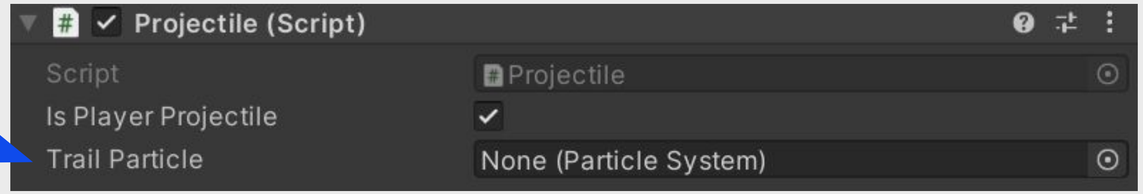
Shuffle is attached to the GameObject projectile. It can be added to anything that moves

Spray and Suck are constantly running. They can be turned on and off in code

Blow and Burst fire once, then need to be stopped. This can be done in code

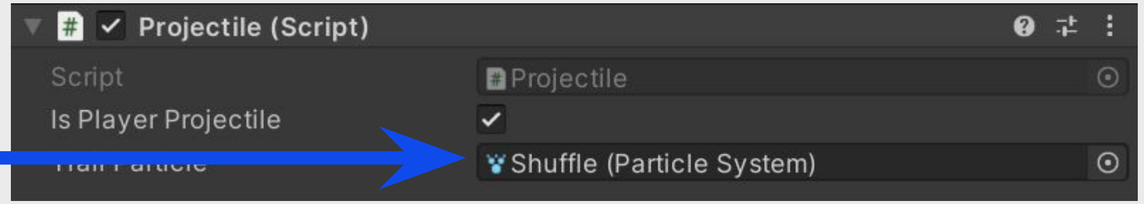
In Projectile (Script)

```
public ParticleSystem trailParticle;
```



Add the effect to the Prefab

Click and drag the effect into the inspector



Find the right place in the Script. You can start and stop the particles like so

particleSystemName.**Play();**

particleSystemName.**Stop();**

There's more to it, so have a look online for more particle system knowledge

https://docs.unity3d.com/ScriptReference/ParticleSystem.html

Get your game tested by someone else.

Did they enjoy it? Was it too difficult/easy?

What else to do?

Here's some extras you can add to your game if you still have time:

Programming

Have a look at existing scripts and see if you can figure out what is happening

Modify existing scripts to change the behaviour of certain things

Design

Add more rooms (scenes)

Modify the player rewards (scriptable object)

Modify the enemy scaling factor (scriptable object)

Mix

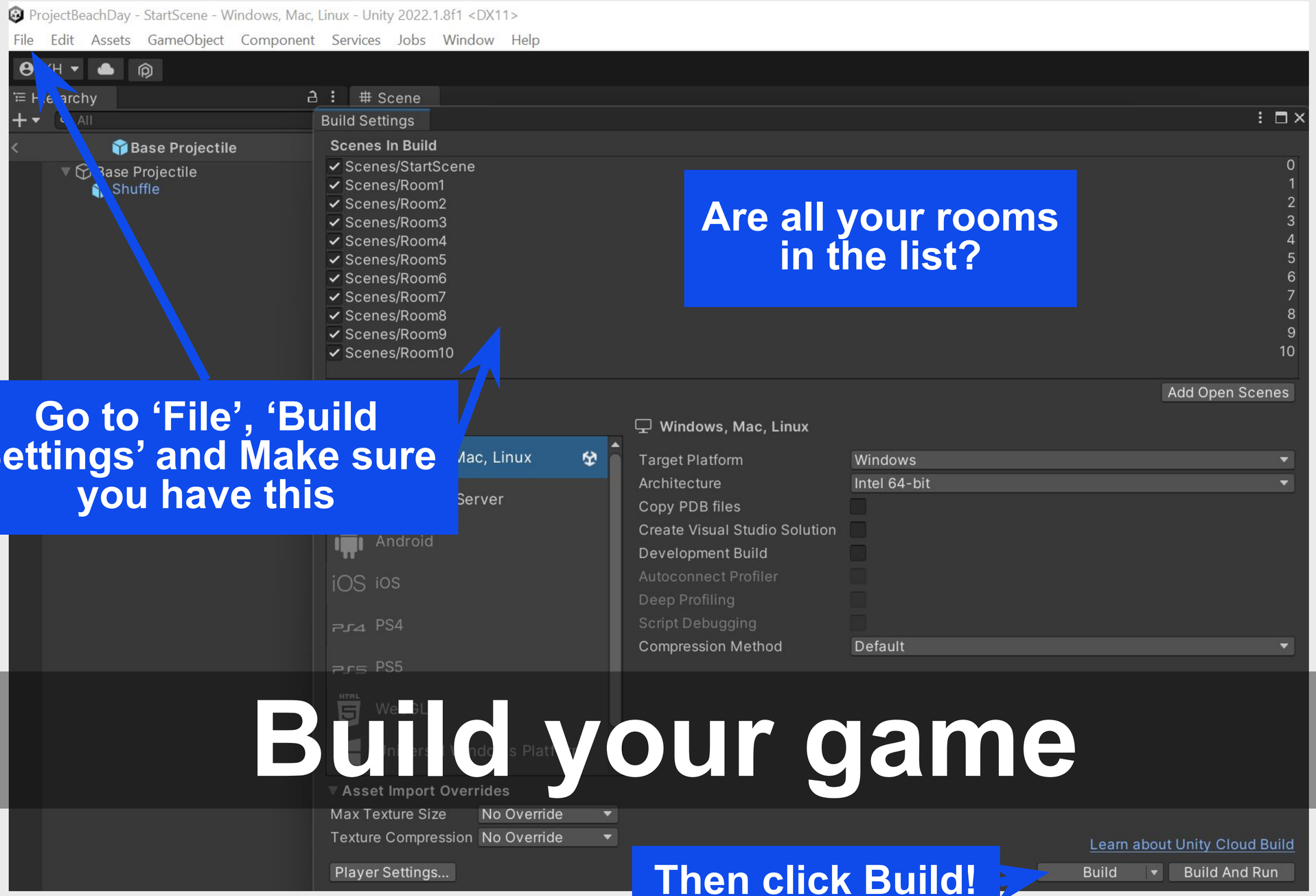
Add a start menu screen

Add in your own sound effects and replace the existing ones

If you’re looking to do this, feel free to use online sources and ask for assistance

Build your game!

We are now going to ‘build’ your game so you can play it without opening Unity.



Build your game

Save your game to a USB or your own computer

Once it is built, you can just double click on it and it will run!