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MakeCode Arcade

What are Video Games?

Video Games

An interactive electronic game that provides visual feedback

The earliest forms came with some of the earliest computers in the 1950's but started to become more prominent with the rise of arcades in the 1970's

Video Games

Games have come on a lot since then! There are all kinds of genres – Can you name any?

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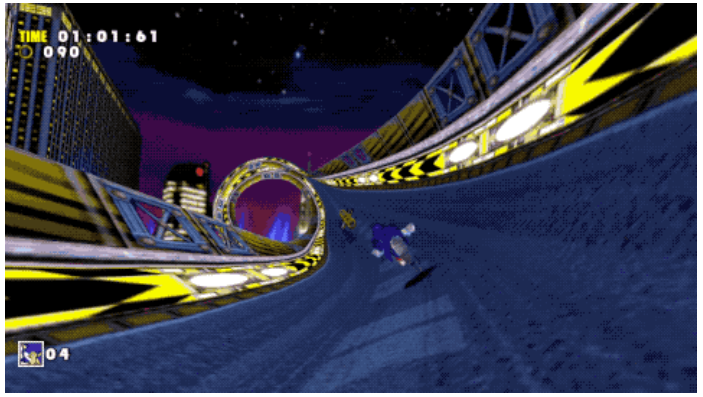
What is a Platformer?

Platformer Defined

Platformers are games that require you to jump from platform to platform.

The genre started out in arcades but became very popular on home consoles with the release of Super Mario Bros on NES

Platformers continued to be a popular/dominant genre on consoles until the end of the 6th generation – PS2, Gamecube, Xbox, Dreamcast



Platformer Defined

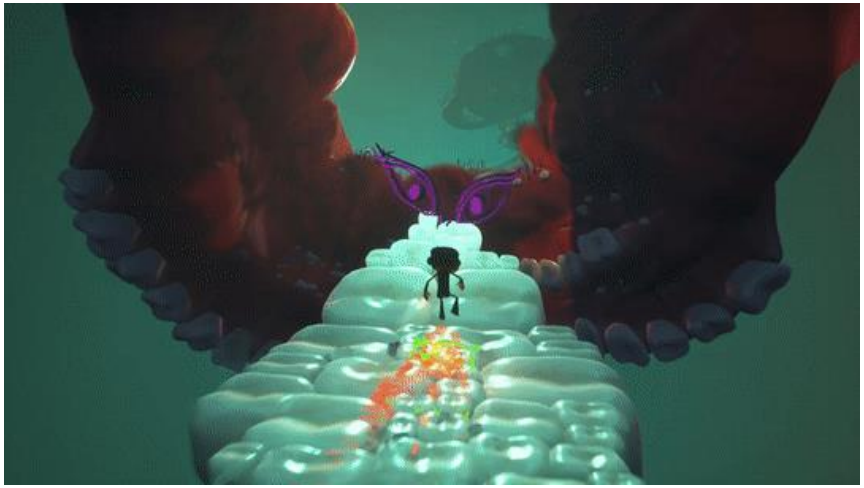
There are only a few big platformer names left in AAA games, but the genre has had a big revival in the indie space

Types of Platformer

There are two broad categories of platformer:

2D Platformer

3D Platformer

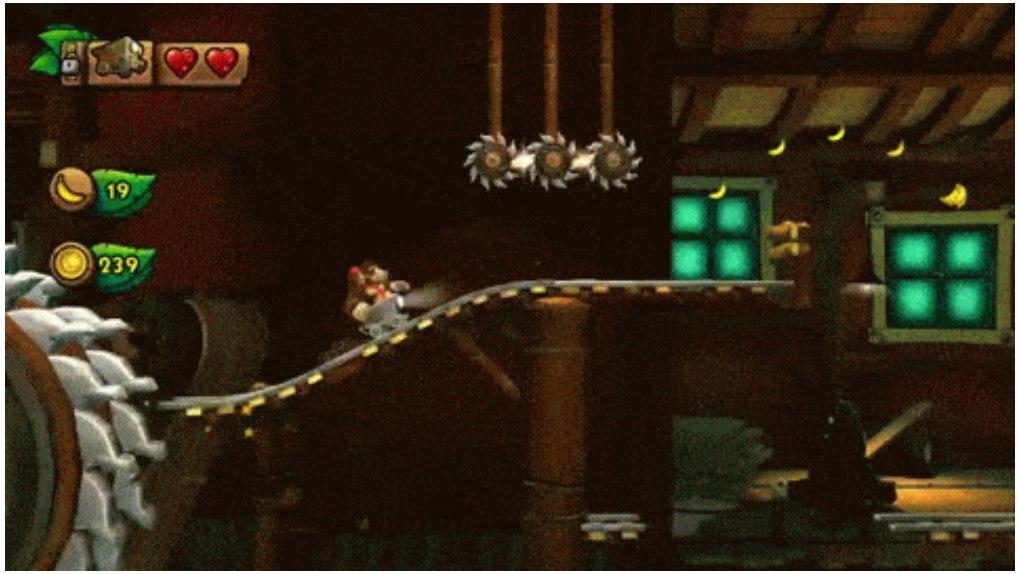


But there are a lot more individual flavours!

Platformer DNA

Platformers come in all shapes and sizes, but they do tend to share common features that make them a platformer

- Player Character
- Jumping Challenges
- Multiple Themed Levels
- Enemies
- Collectibles
- Power-Ups
- Level "Gimmicks"
- Story-Lite



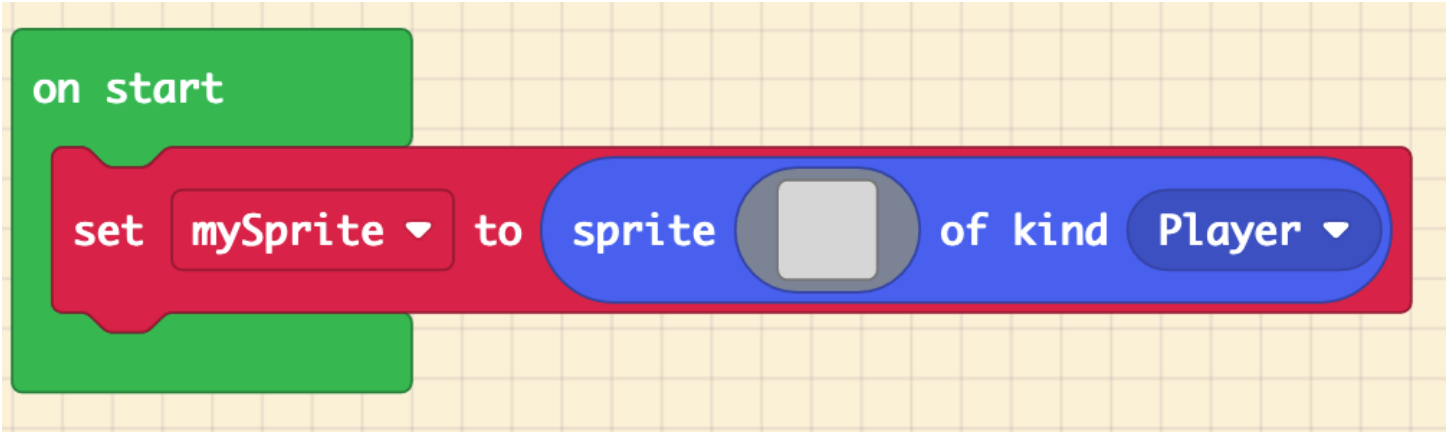
Making our Game

arcade.makecode.com

Sprites

Sprites represent objects that have special behaviour

This includes the player character, who can move, and also includes enemies, pick-ups, other characters, etc



Art Style

The Art Style of our game refers to the look and feel of the artwork.

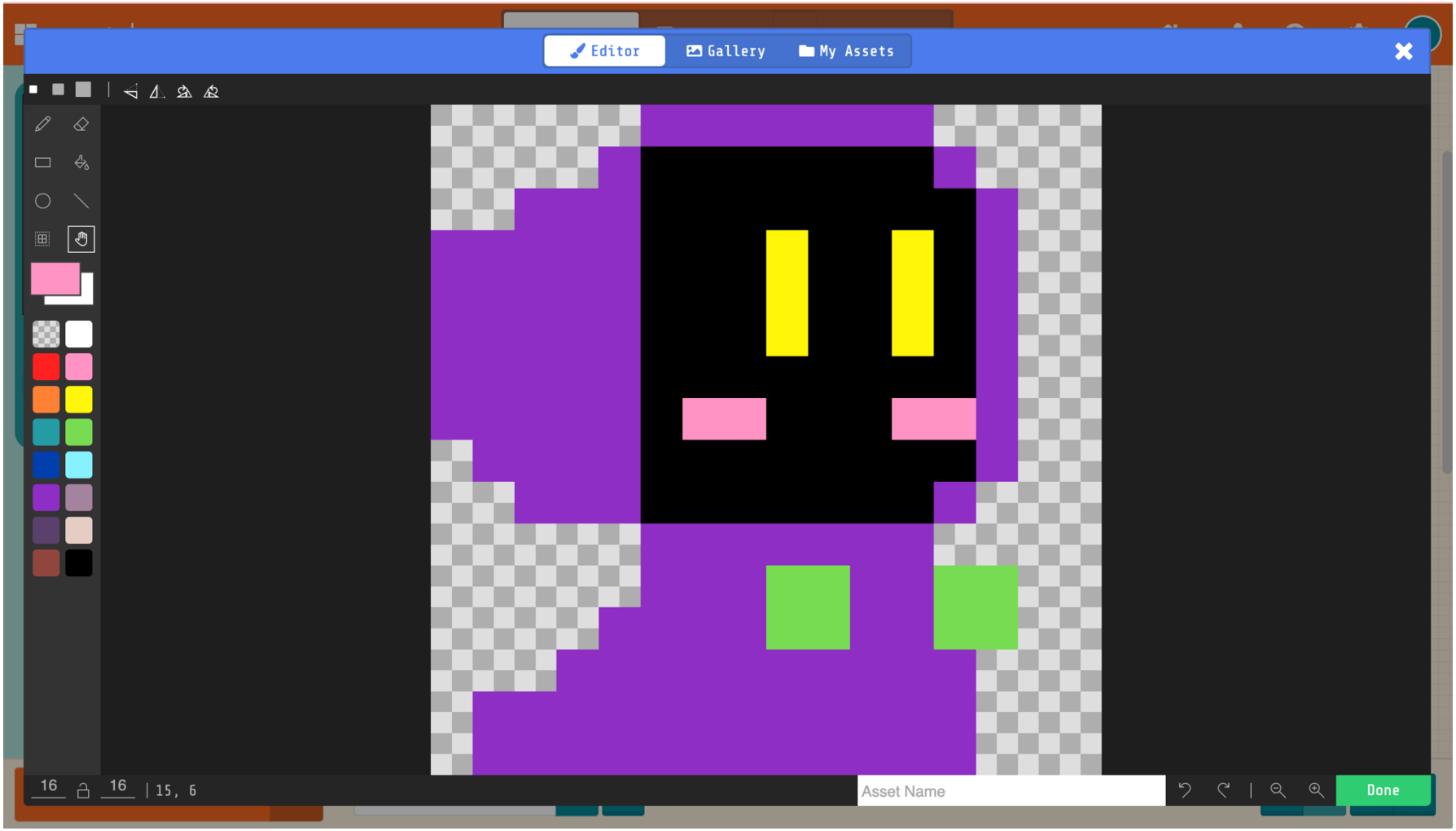
In MakeCode we need to use a pixelated Art Style because the hardware isn't very powerful. Less powerful hardware can display fewer pixels

A NES (1983) could display 256 **horizontal** pixels by 240 **vertical**

A Sony PlayStation 5 (2020) can display 3840 by 2160 pixels

MakeCode can only display 160 pixels by 120

Draw Your Main Character



Position & Movement

Position

We need to know where on the map our sprites are. Therefore we need to track both its **Horizontal** and **Vertical** position

The horizontal position is called the **x position** and the vertical position is called the **y position** – like on a graph

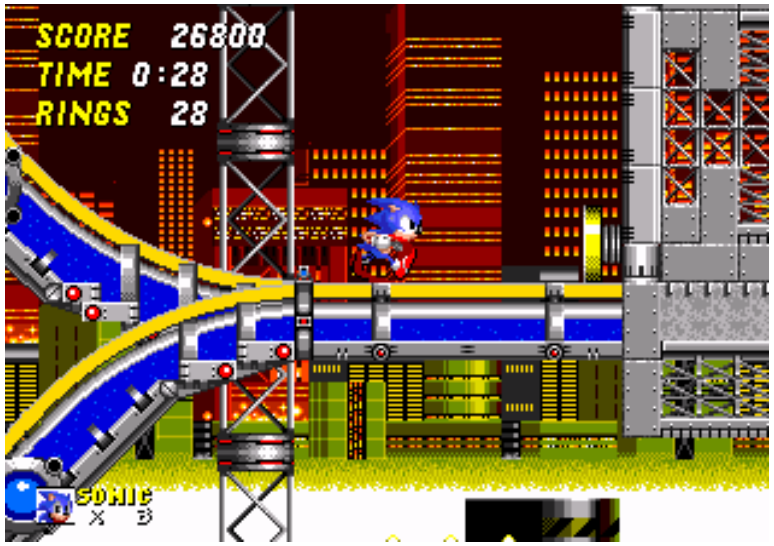
The x position shows how many pixels away from the left our sprite is and the y position shows how many pixels our sprite is from the top

Movement & Velocity

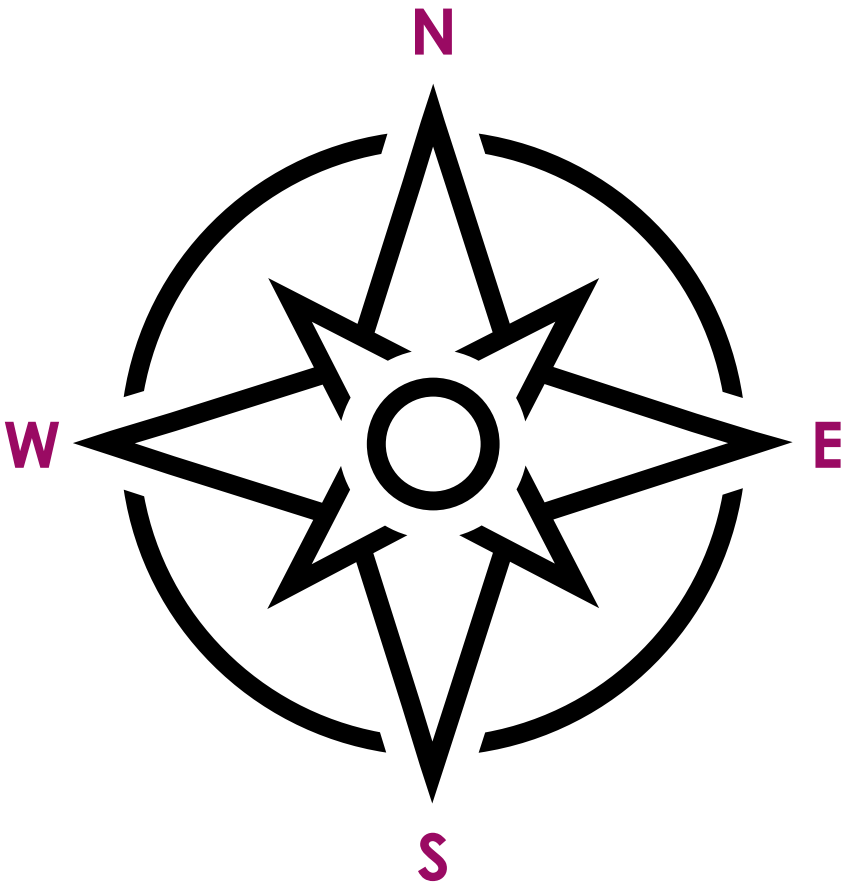
Movement of our sprites is controlled by a value called **velocity**.

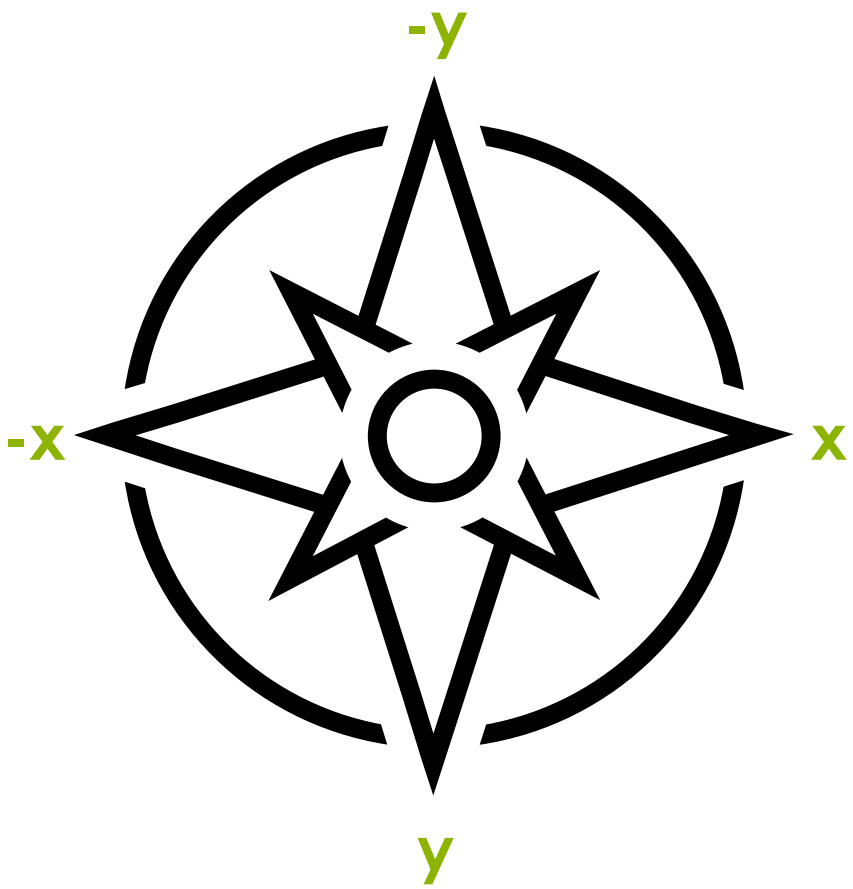
Velocity is **speed** with **direction**. We can say "go left at 5 miles per hour".

In game design we don't have up, down, left, or right. We need to use **x** and **y** again.



Compass

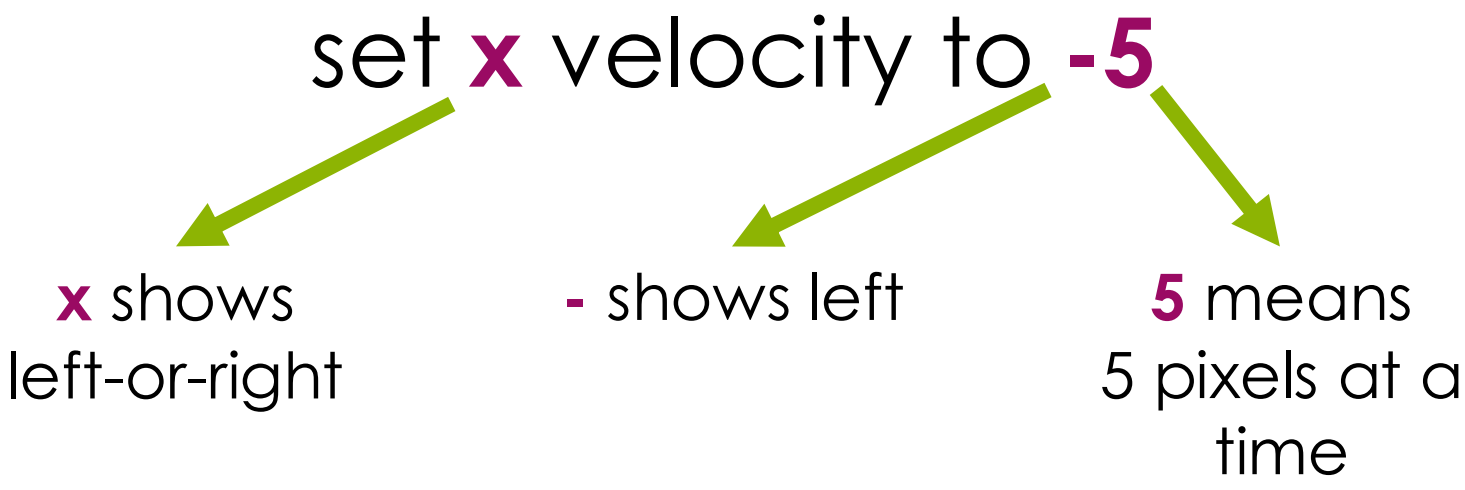




Velocity

So if we want to go left at a speed of 5, we need to look at the compass to see what direction is left.

Left is **-x** so we need a **minus x** number:



Events

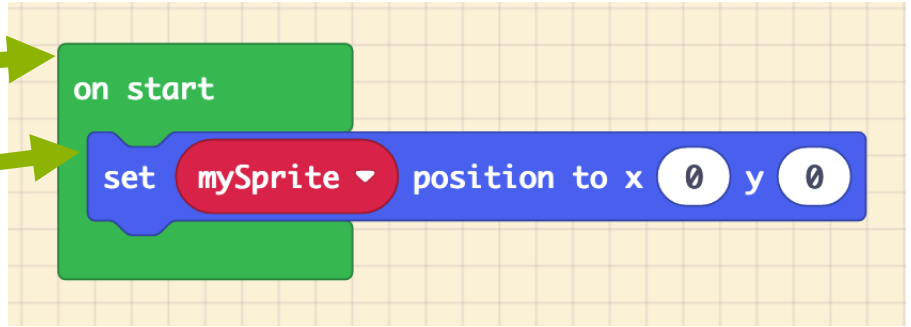
MakeCode is **Event-Driven**. This means that different sections of code are triggered to run when different events happen.

Some events happen automatically whilst others happen when the player does something.

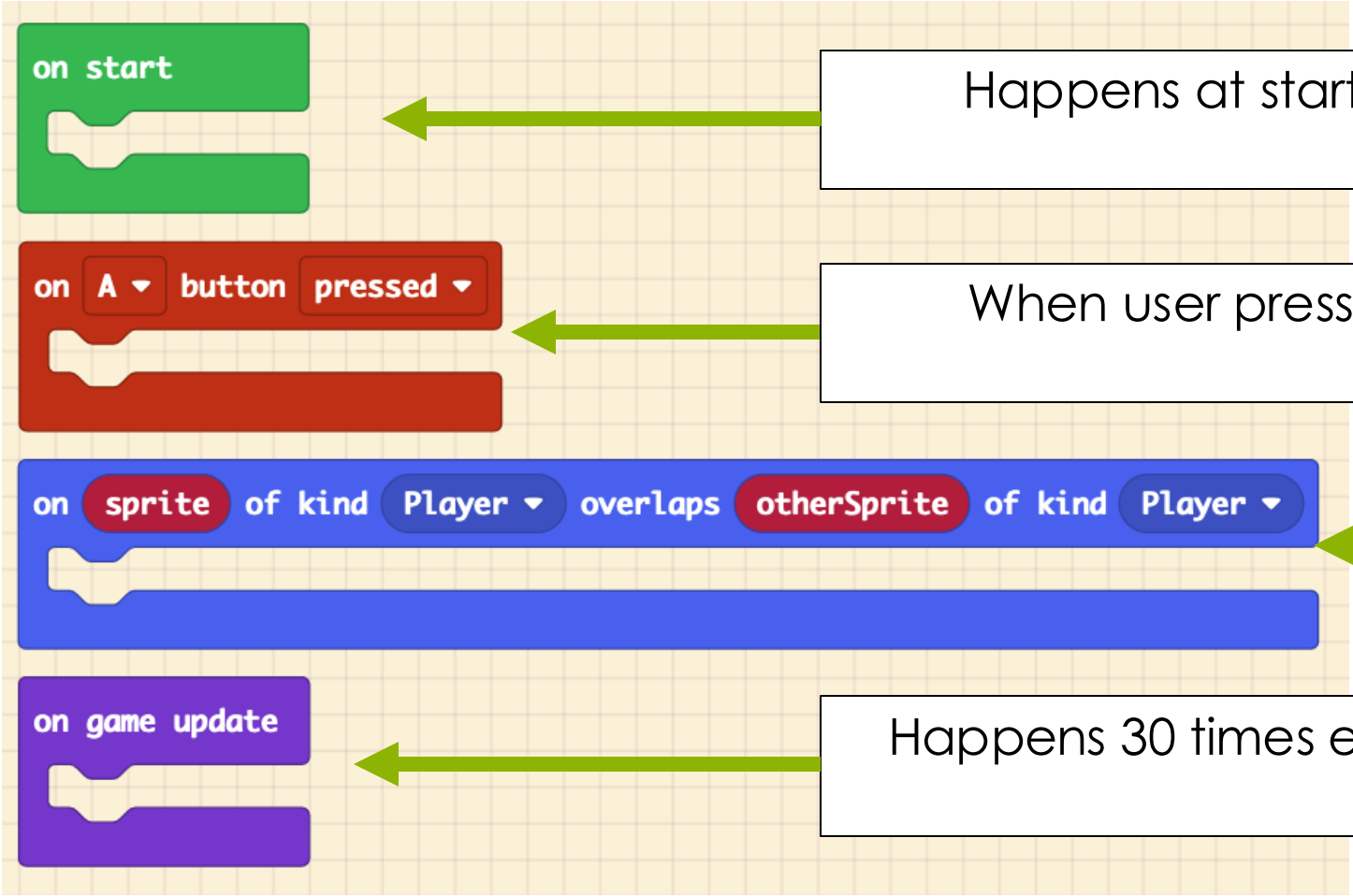
An event is a block that has no divot. That means it stands alone (no code sits on top of or around it).

No divot

Divot



Events



Happens at start of game

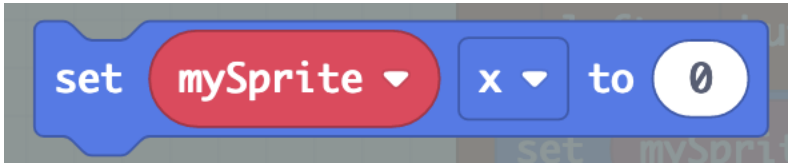
When user presses button

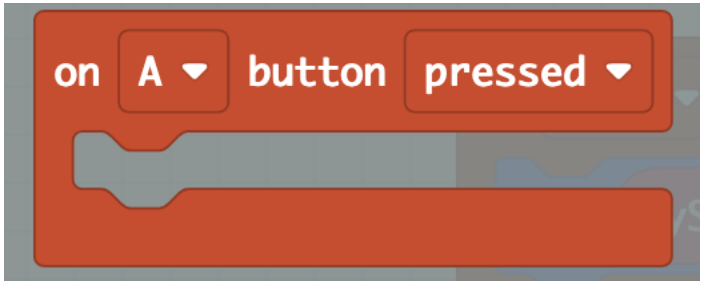
When sprites collide

Happens 30 times every second

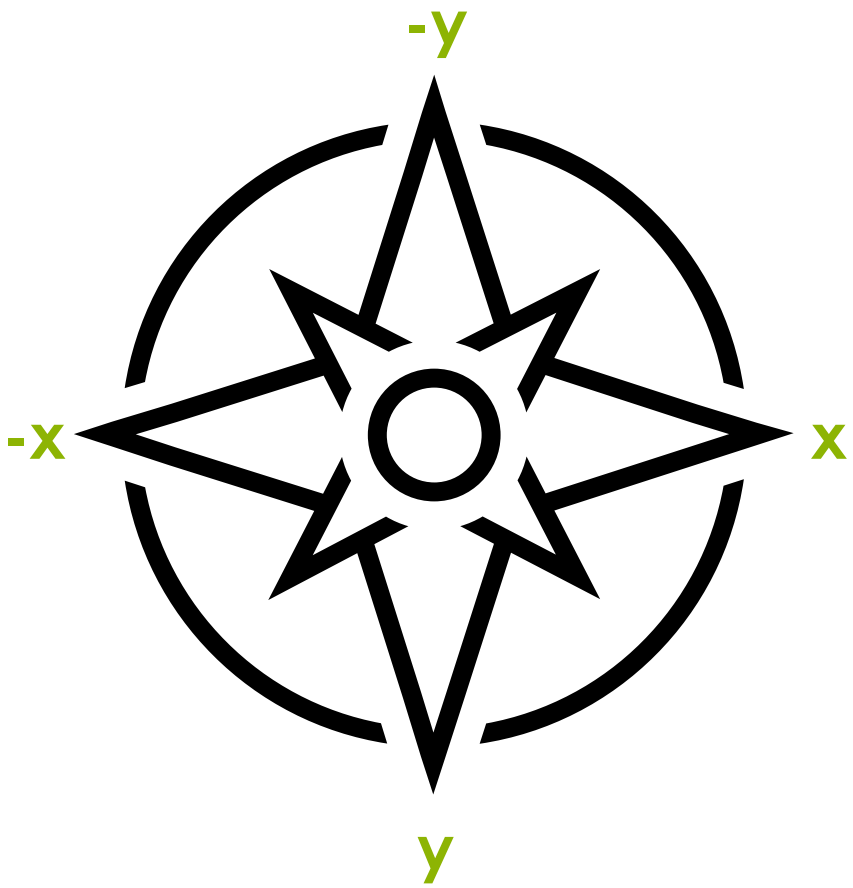
Controls

Combine these block so your main character moves left and right when the corresponding arrow key is pressed.





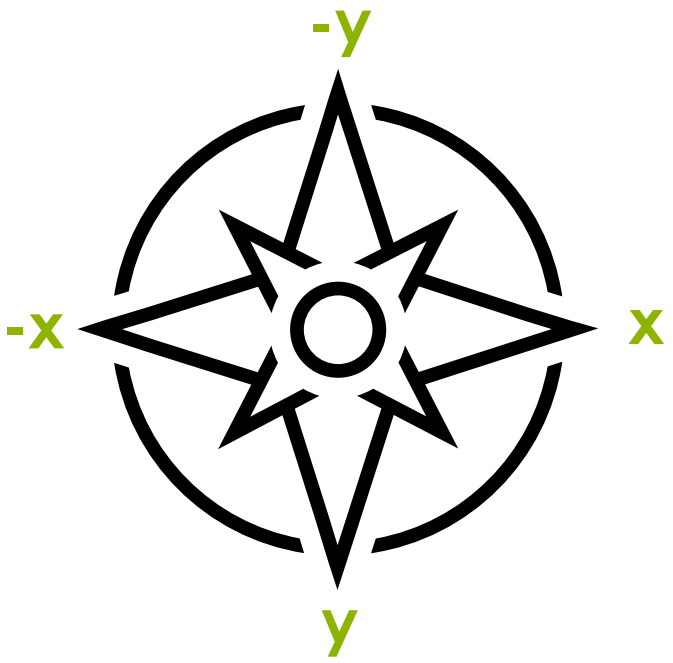
How do you make your character stop when you let go of the key?



Jumping

Jumping is one of the most important abilities for our character in a platformer.

Jumping is **vertical** movement so you will need to adjust the **y velocity**.

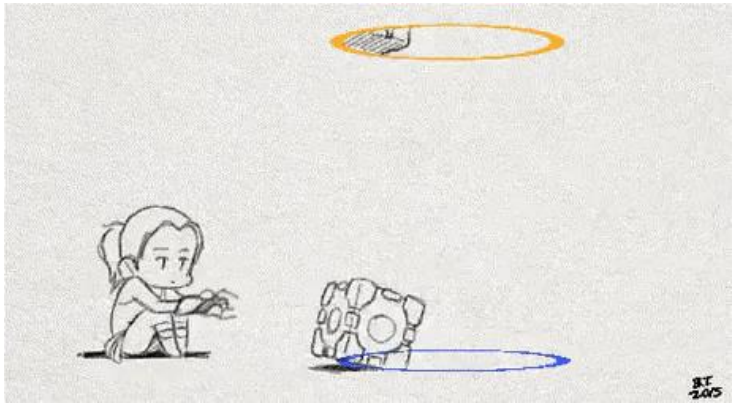


Try making your character jump when the A button is pressed.

What happens?

Gravity

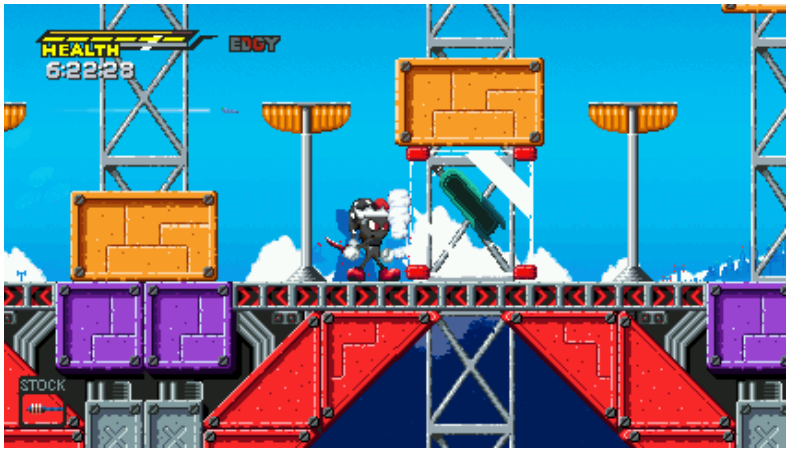
Without gravity our character move upwards forever when they jump!



Gravity is a constant downward **acceleration** affecting our character.

This makes it easy to implement some basic gravity if we know what we're doing!

Acceleration Vs Velocity



Velocity is speed and direction

Acceleration is the rate of change in velocity

Acceleration can cause speed to **increase** and **decrease**

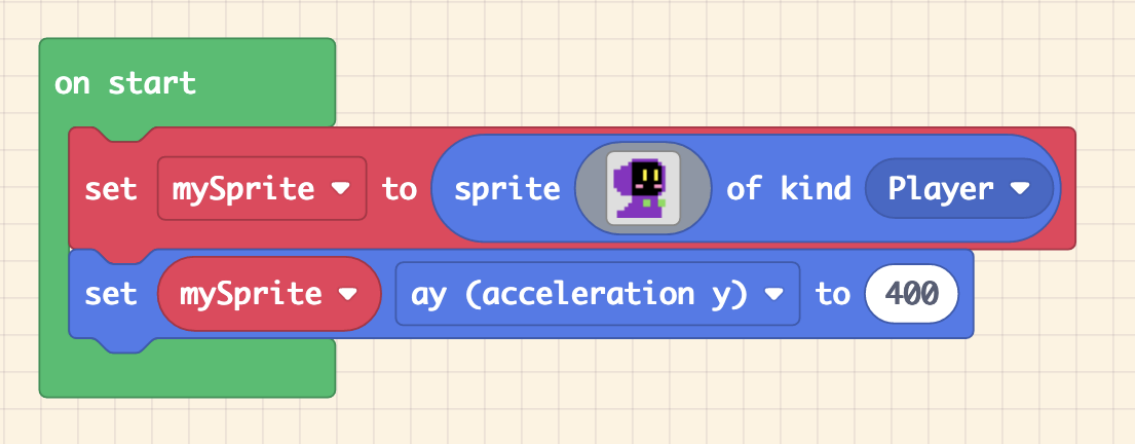
What happens if a sprite is moving with a **positive x velocity** but has a **negative x acceleration?**

It will first **slow down** to a stop, then it will start moving **faster and faster** in the opposite direction.

Adding Gravity

To add gravity we need to give our main character a **constant downward acceleration**.

We can set this at the start of our game:



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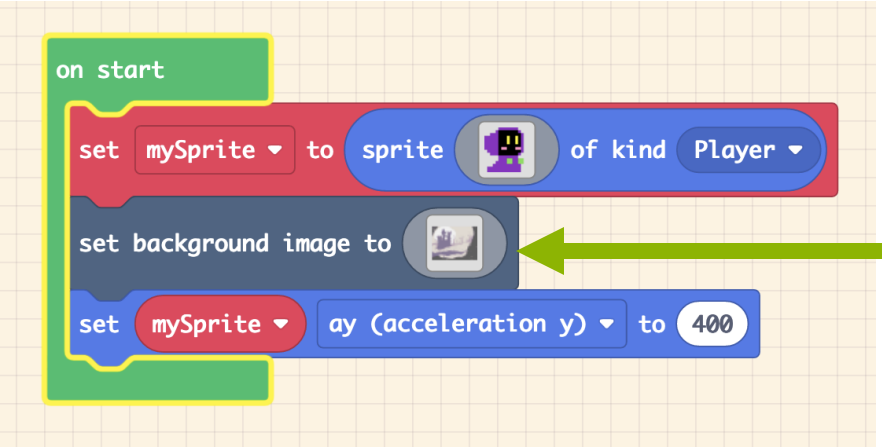
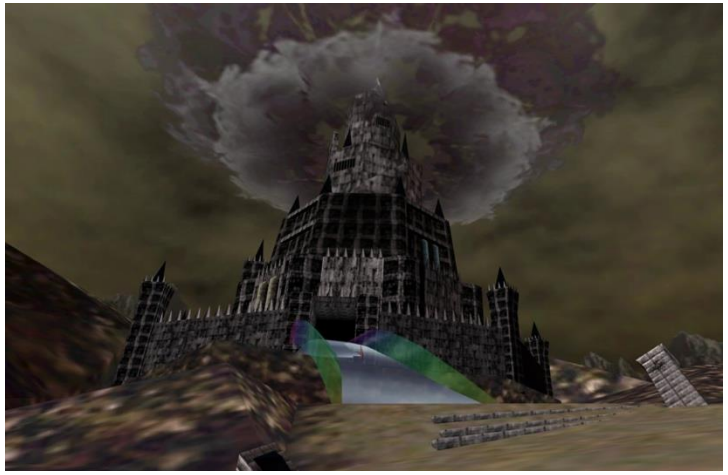
Level Design

Aesthetic

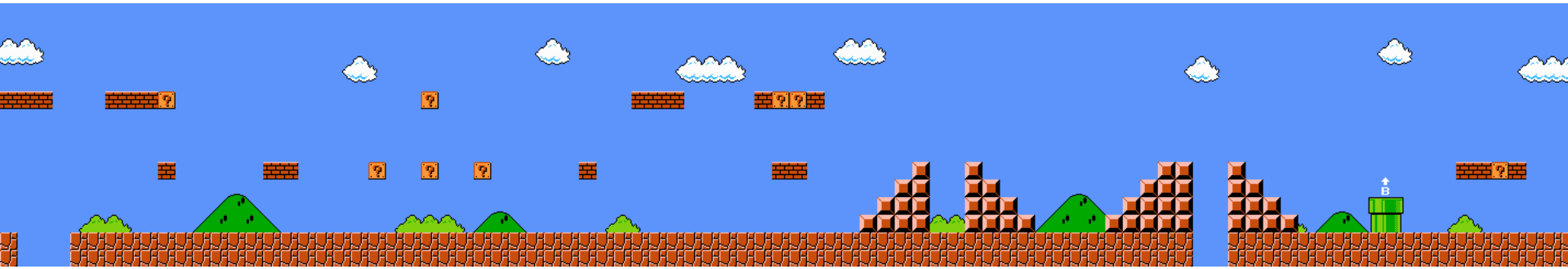
The themes and art assets used can give levels a very different feel.

Place this block and pick one of the pre-made backgrounds:





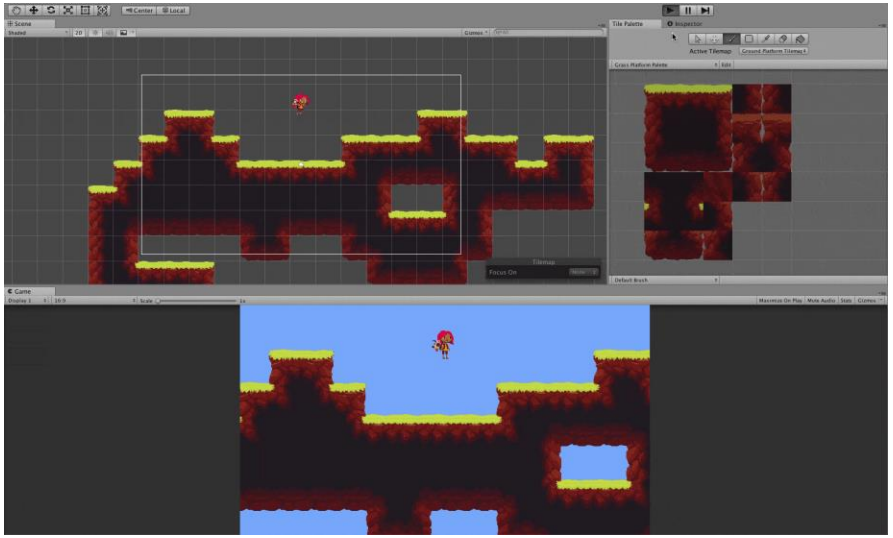
What do you want from a level?

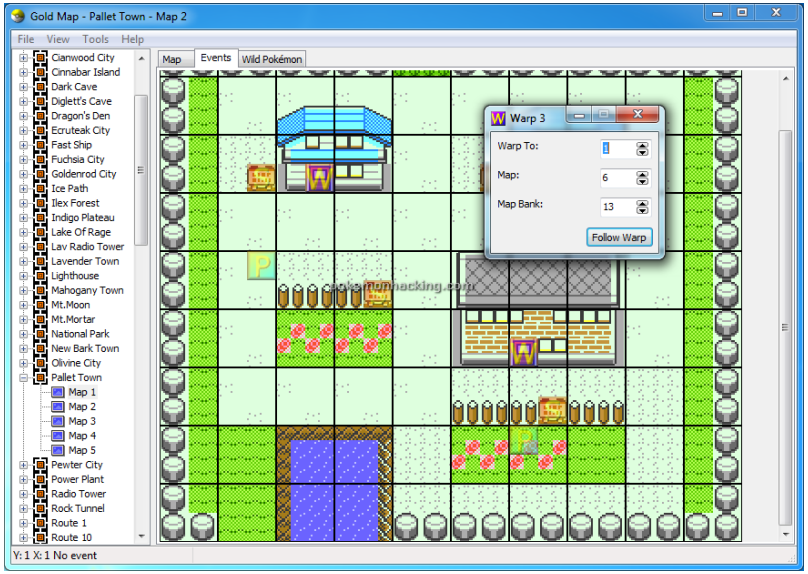


Tilemap

A Tile Map acts like a background to our level.

It's made up of several squares, each square with a different part of the background.

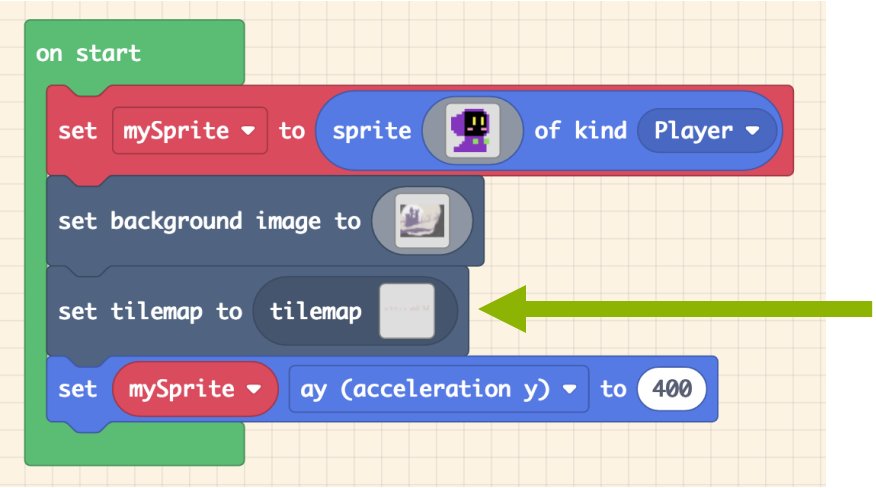




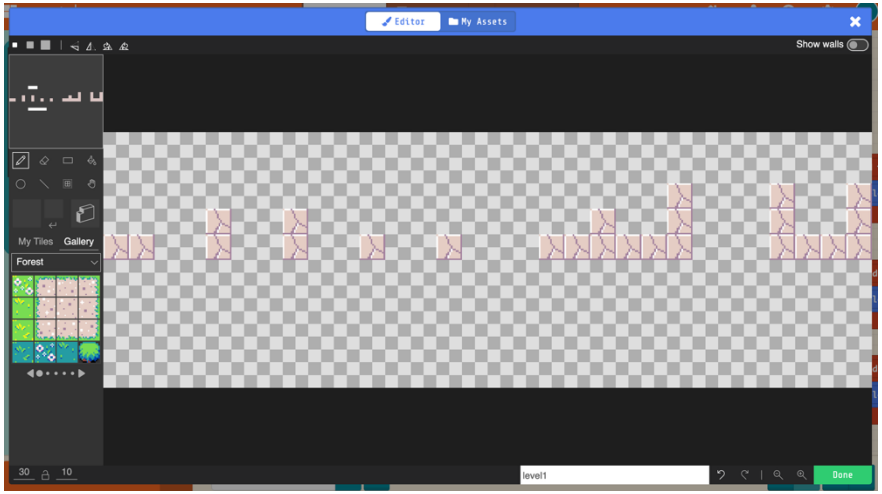
Tile Maps make it easy for developers to create new maps and levels without having to draw a new background every time they change part of the level.

Tilemap

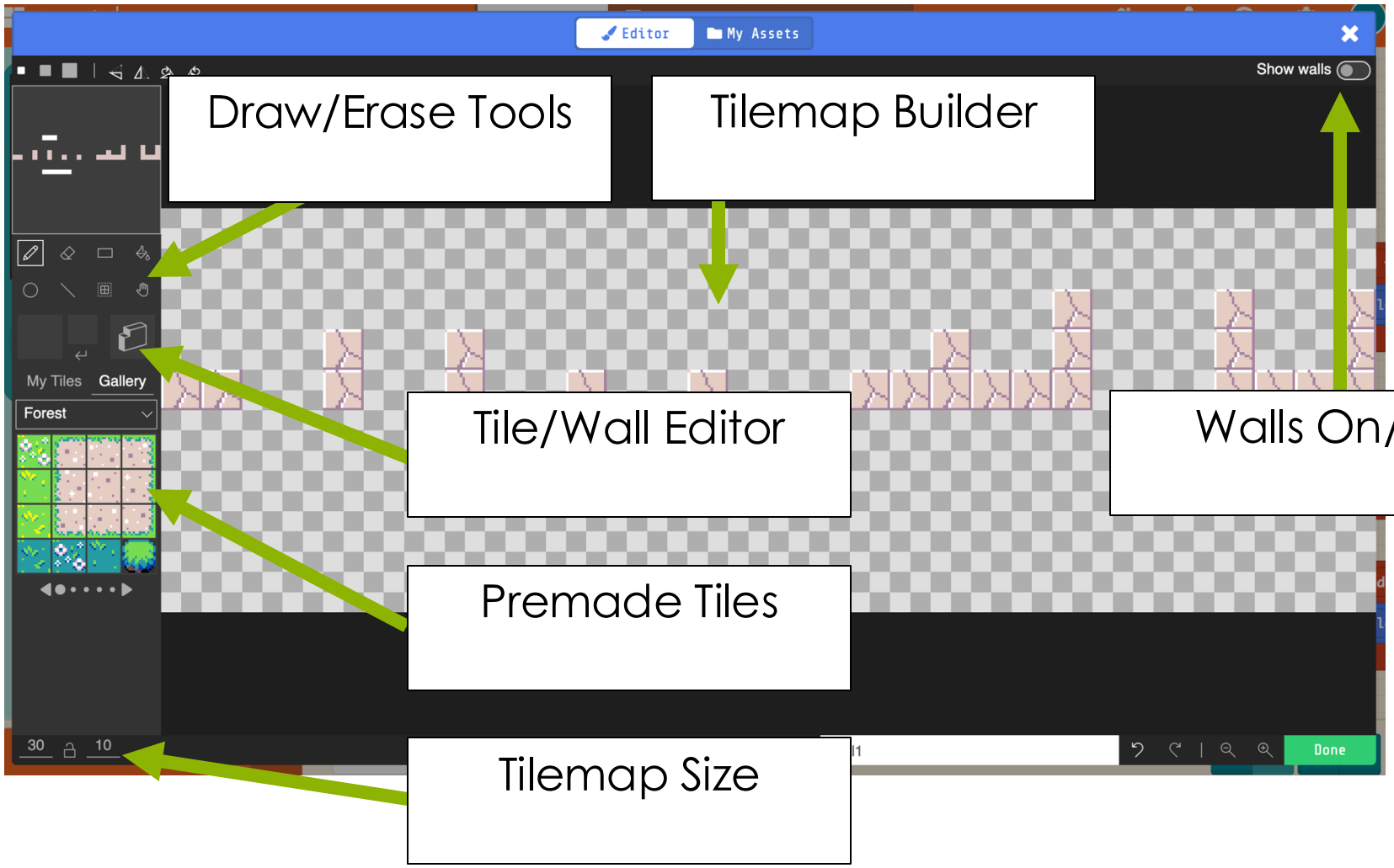
Grab the 'set tilemap' block and drop it into your code



Click on the block to start building your first tilemap (ie your first level)

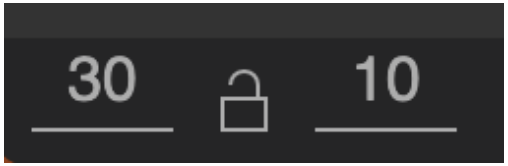


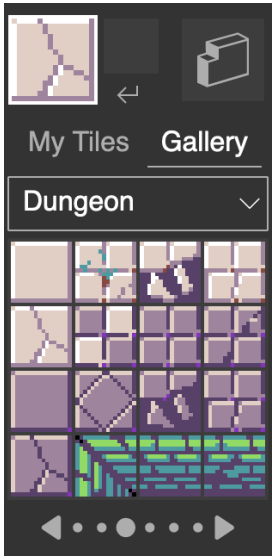
Tilemap Editor



Making a Level

1. Set the size of your tilemap to 30 x 10 – you can change this later to make it longer/taller

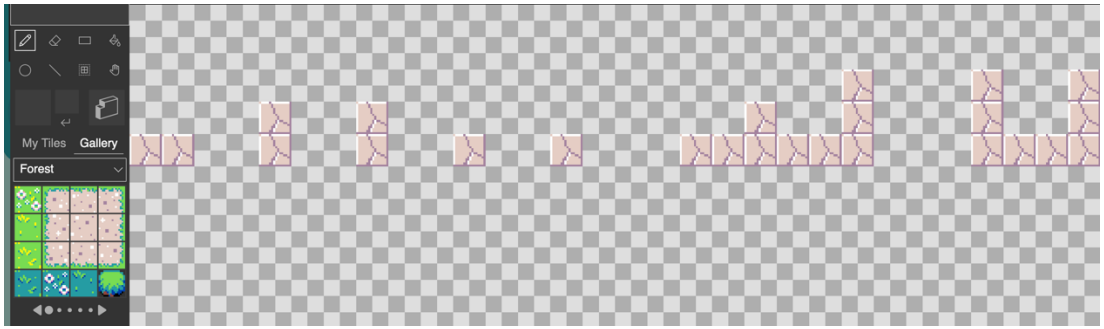




2. Pick one of the premade tiles to act as your platforms in the level

Try to find one that matches your background.

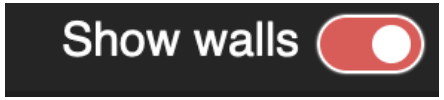
3. Use the drawing tools to start placing your tiles to make a level



Making a Level

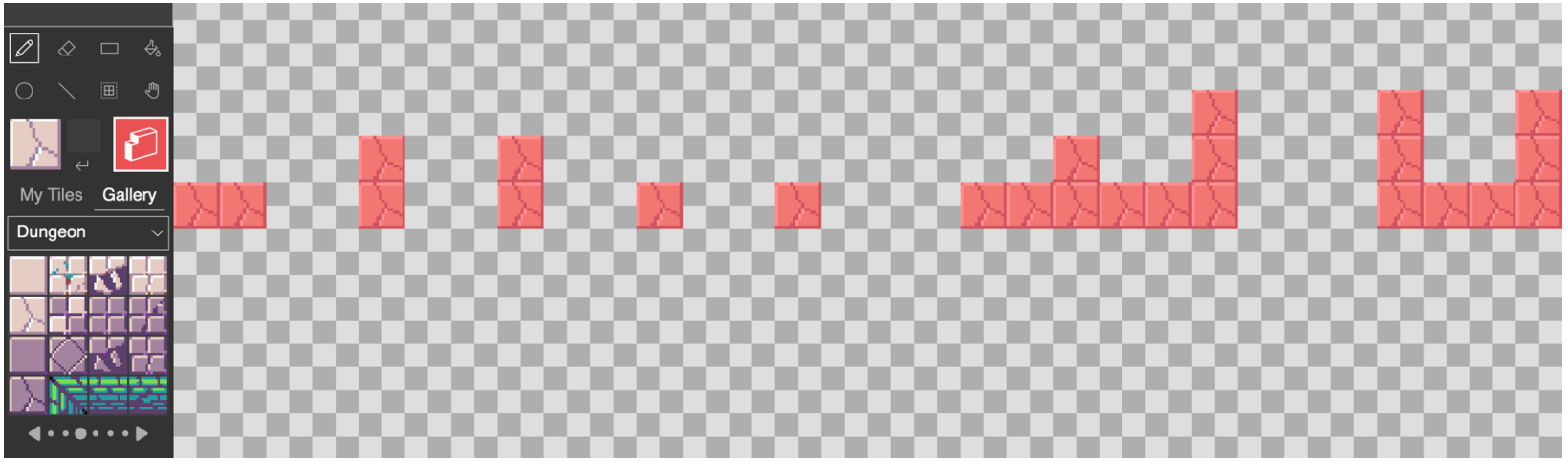
Now we need to turn our platform tiles into walls:

4. Make sure the editor is set to show walls



5. Make sure to select the wall tool

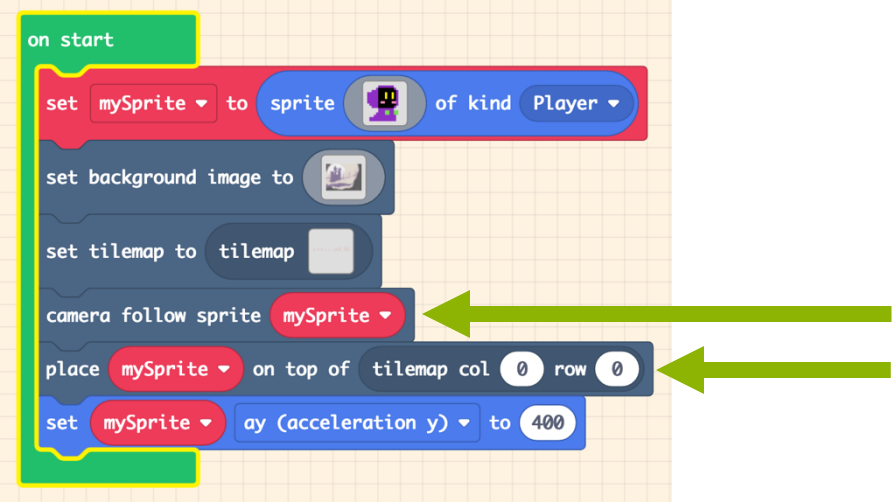
6. Draw over your platform tiles to make them walls



Testing

It's important to playtest our level to find any glitches and make sure it's fun to play

Place these two blocks into "on start" – What are they doing?



Are there any problems with your level?

How can you solve them?

Try adjusting your gravity acceleration and the velocity for moving left, right and jumping until it "feels" good to play through your level.

Extensions

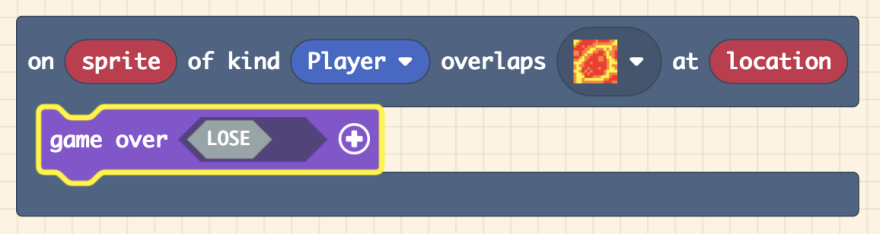
- Game Overs (winning & losing)
- Fix Infinite Jumping
- Animation
- Collectibles

Winning & Losing

Game Over (Lose)

These blocks cause a game over when your character touches a specific tile

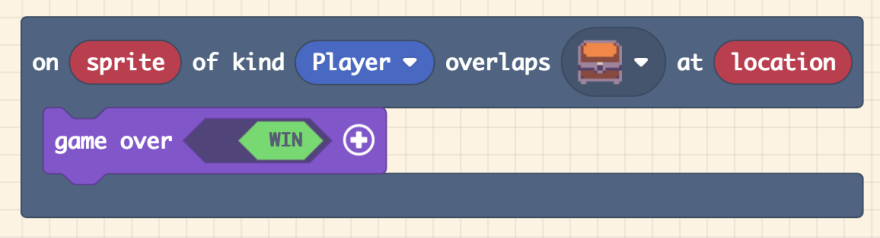
A lava tile is being used here but you could use any kind of tile you like



Game Over (Win)

The same as above but this time we set the game over block to "win" when touching a specific tile

If you have collectibles, you could set your game to be over when they have all been found



Extensions

- Fix Infinite Jumping
- Animation
- Collectibles

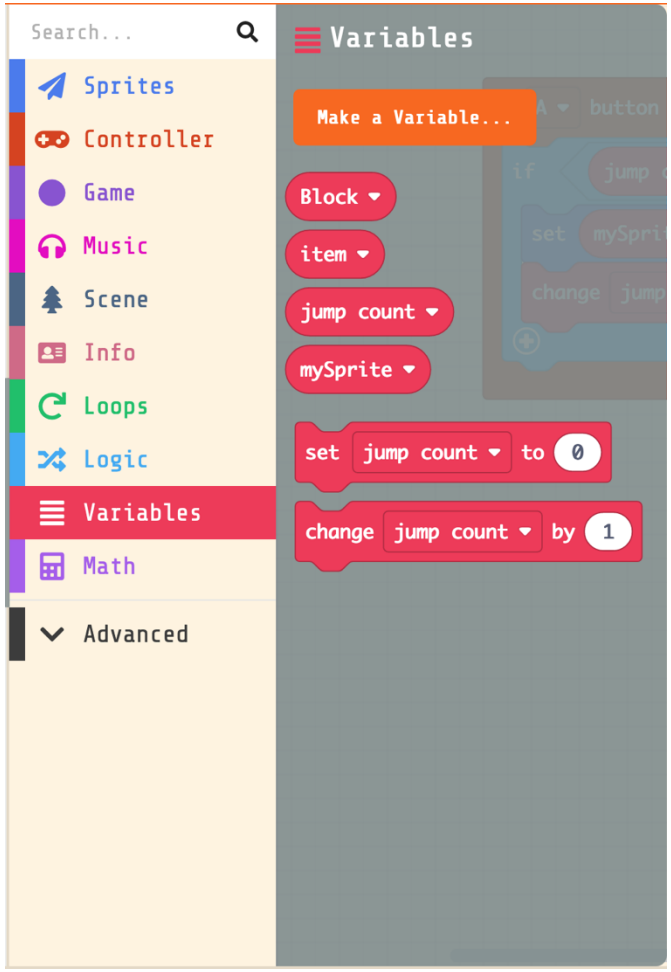
Infinite Jumping

Infinite Jumping

At the moment our characters jump infinitely.

This can be good for testing our game but not necessarily for playing it!

To fix it we will need to make a variable

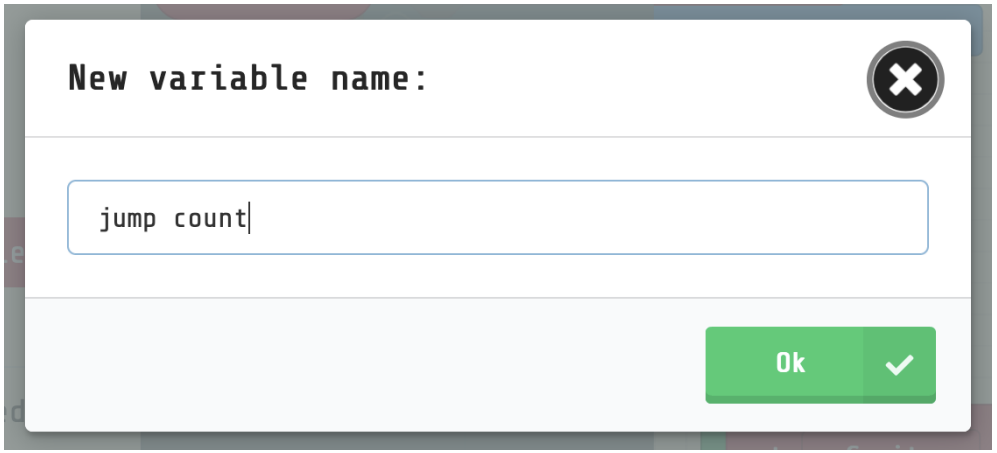


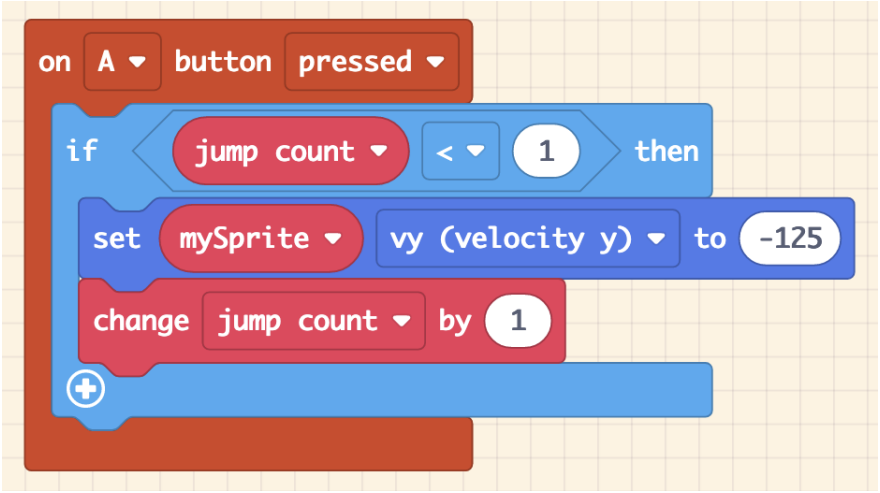
Infinite Jumping

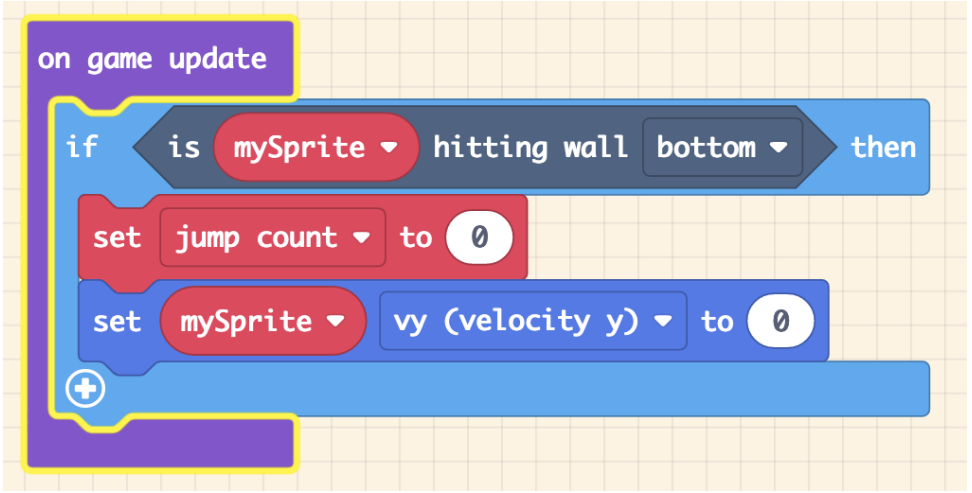
Infinite Jumping

We can keep track of how many times we have jumped since last standing on a platform

Then tell the game it can only jump a certain number of times







Extensions

- Game Overs (winning & losing)
- Animation
- Collectibles

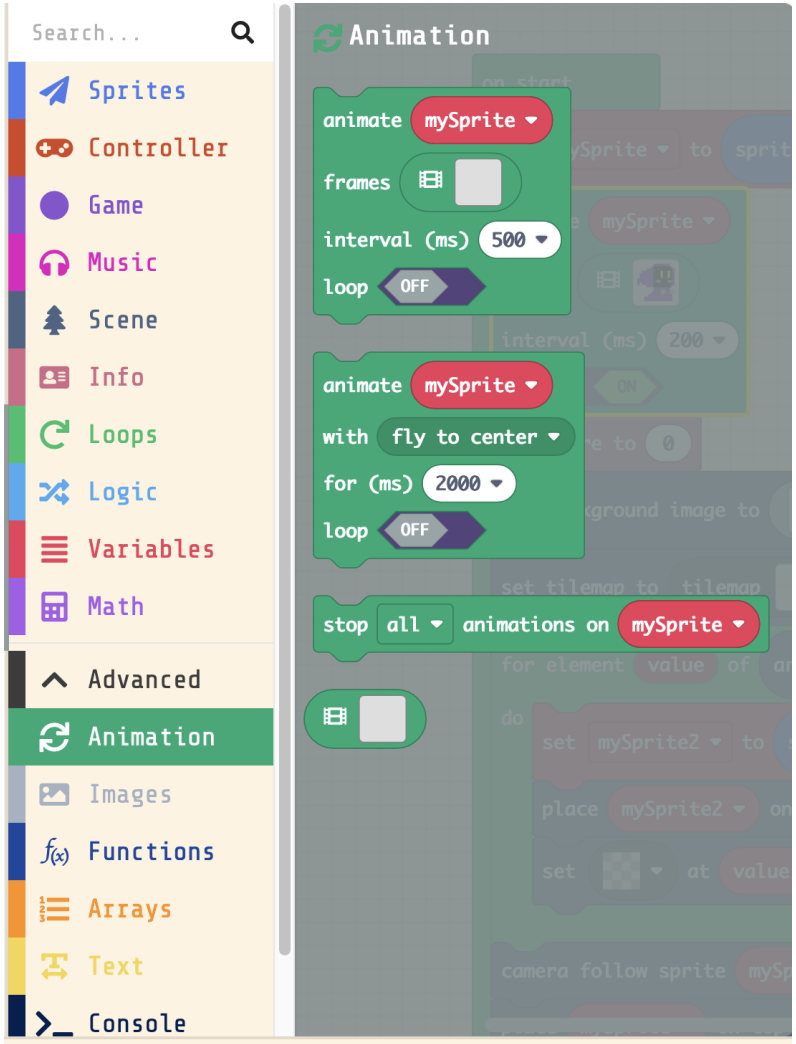
Animation

Animation

Animation can make our game nicer to look at and feel more alive

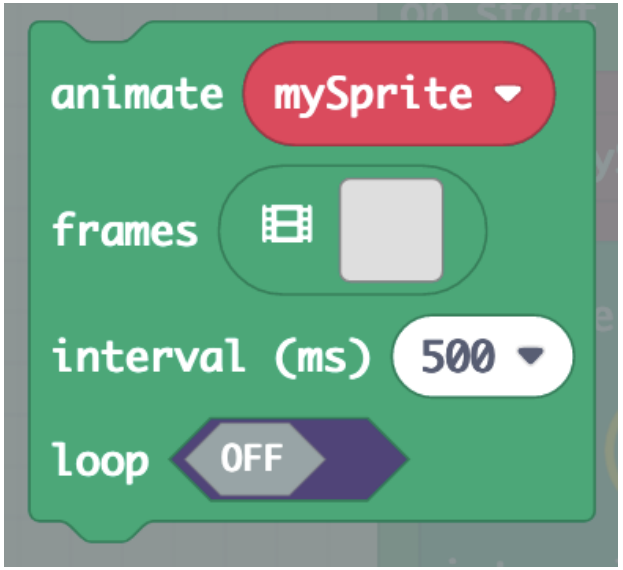
Animations can become very complex but a simple 2 frame animation can look effective too!

Makecode helpfully has animation blocks included in the advanced section

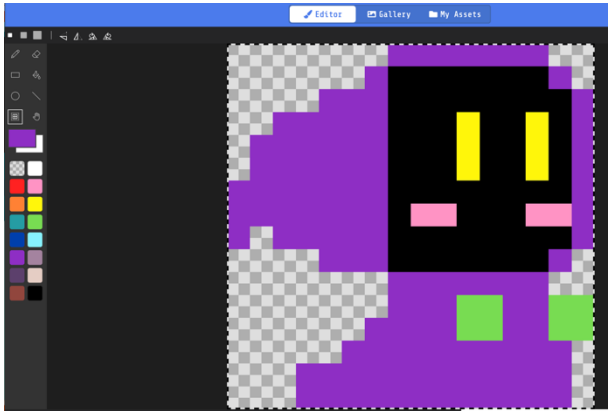


Animation

First we want the 'animate sprite with frames' block and we want it to loop



Now we can start drawing our frames but to save time we can copy and paste from our original sprite



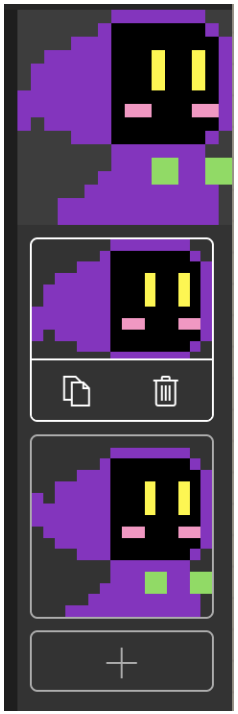
Highlight your sprite with the selection tool and press 'ctrl c' to copy.

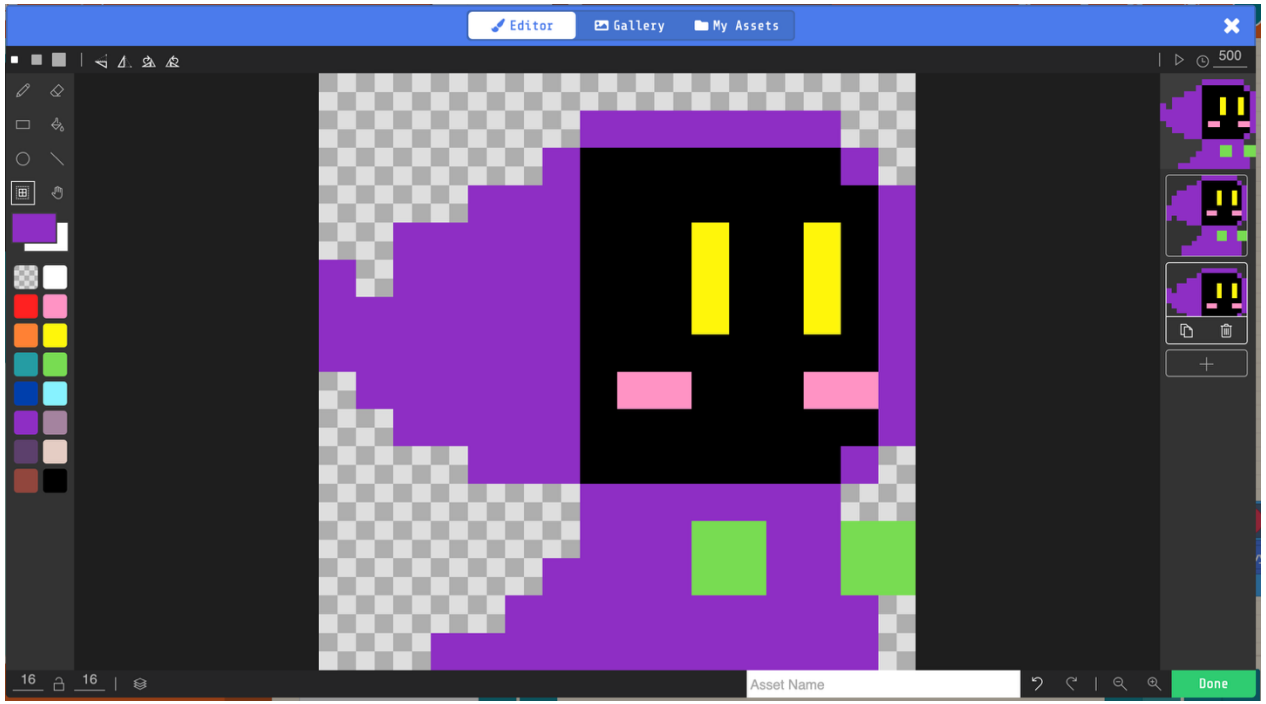
Then highlight your animation frame canvas and use 'ctrl v' to paste

Animation

Leave your first frame as is and add a second frame

Paste your sprite again but make some changes to make it look like its bobbing up/down, swinging its arms or opening its mouth etc





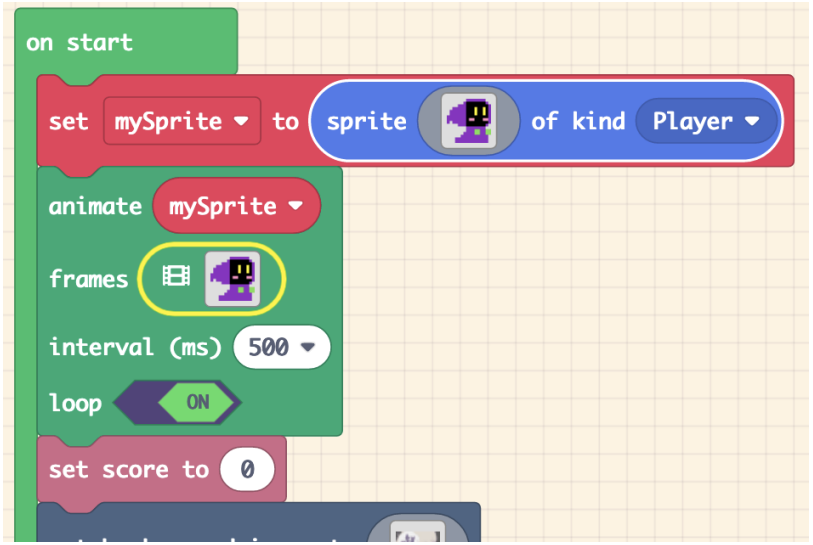
Animation

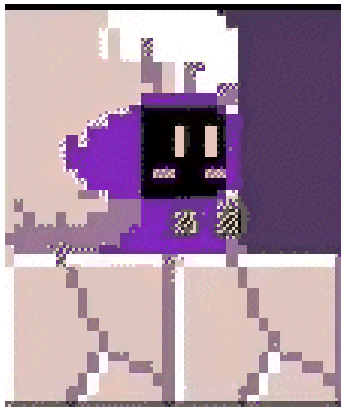
Now set your animation to loop and it should work!

You can adjust the interval (wait time) between frames to make the animation faster or slower

You can add more frames to make your animation smoother or more complex

Its even possible to make different animations for walking, running, jumping etc.





Extensions

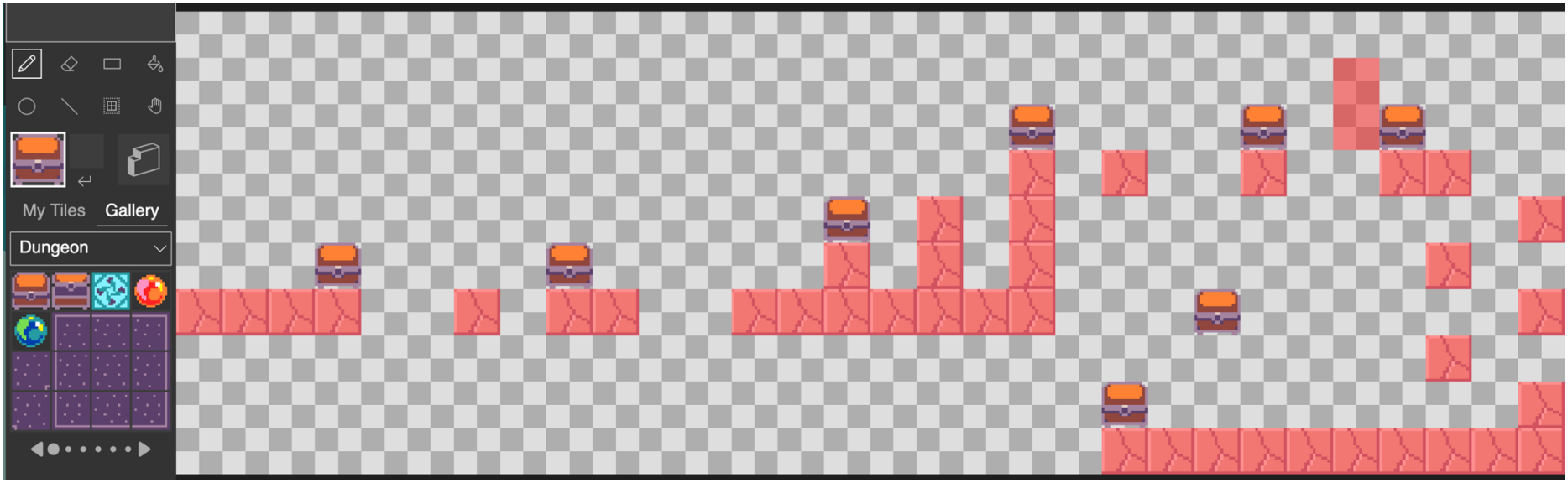
- Game Overs (winning & losing)
- Fix Infinite Jumping
- Collectibles

Collectibles

Collectibles

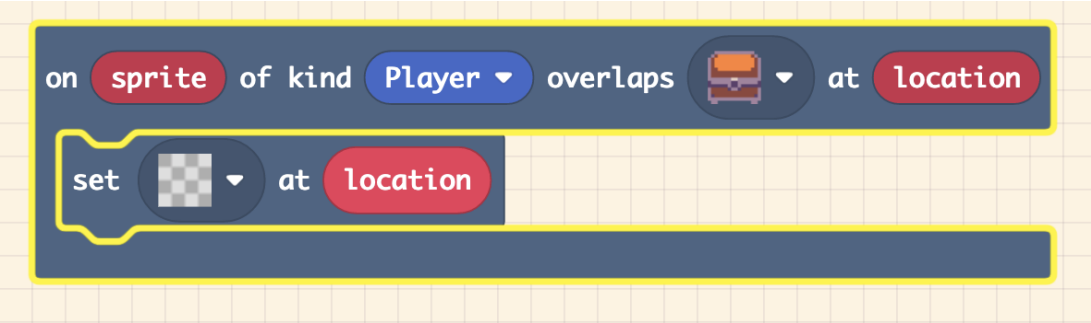
First we need to select a tile (or design a new one) to act as our collectible.

Then we can place it around our level:



Collectibles

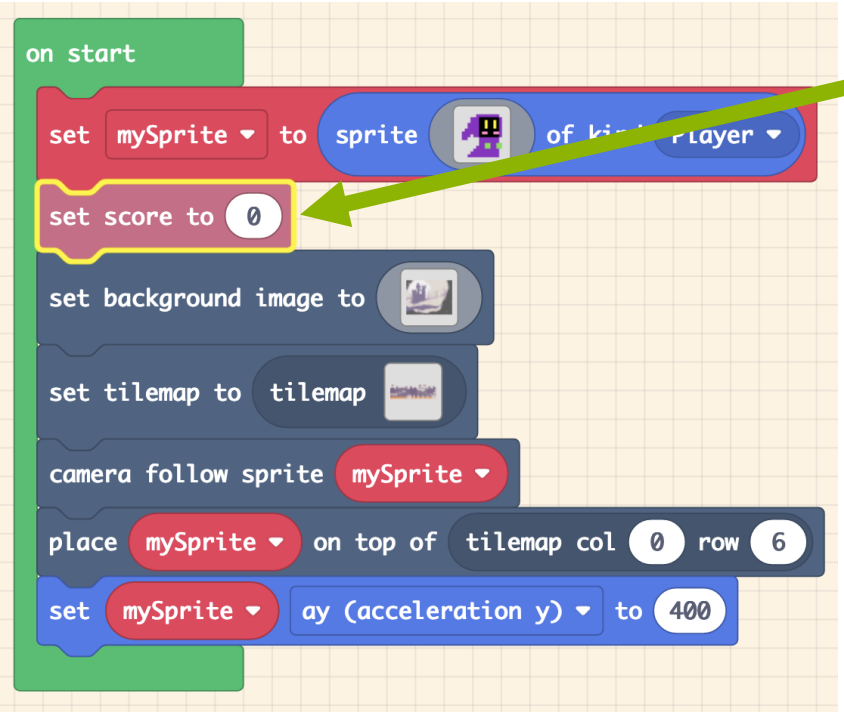
Now we put in some blocks telling our game to delete the tile when our player character comes into contact:



We could also set it to swap to another appropriate tile, like scenery or this one that makes it look like the chest was opened:

Collectibles

Now we can tell the game to react to our main character collecting the collectibles! Makecode helpfully has a score function built in:



Set score to 0 when game begins

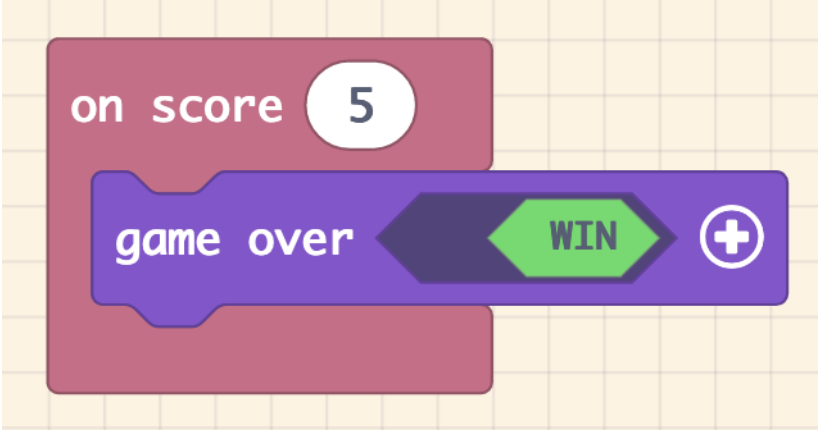
+1 to score when a collectible is picked up

Collectibles

You can even set your game to be won when all/enough of the collectibles have been found!

If you do this your game would become more of a treasure hunt. That might mean you want to try a more open-ended level design

Have a think about what you want from your game, the best way to implement score and how you want your game to be “won”.



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