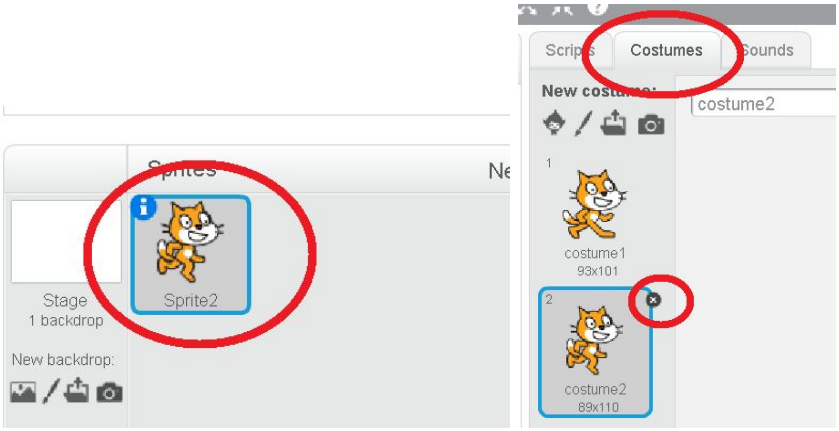
Scratch - Space Invaders

This project will teach you how to build a simple version of Space Invaders in Scratch.

Create Player

Start with a Blank Project, you will be given a default sprite that uses the Cat image. We will replace this with three simple rectangles.

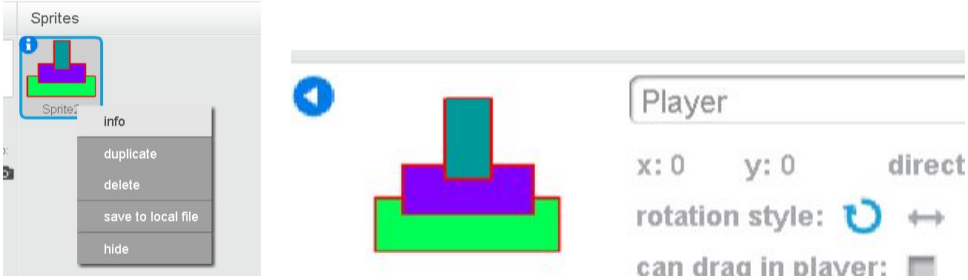
- Click on the sprite
- Click on the **costumes** tab
- Click on the second costume
- Click on the (x) to delete this costume



Rename the Sprite

We will have a number of sprites in our finished project, so let us give this sprite the name of **Player** to allow us to tell it apart from the others in our code later.

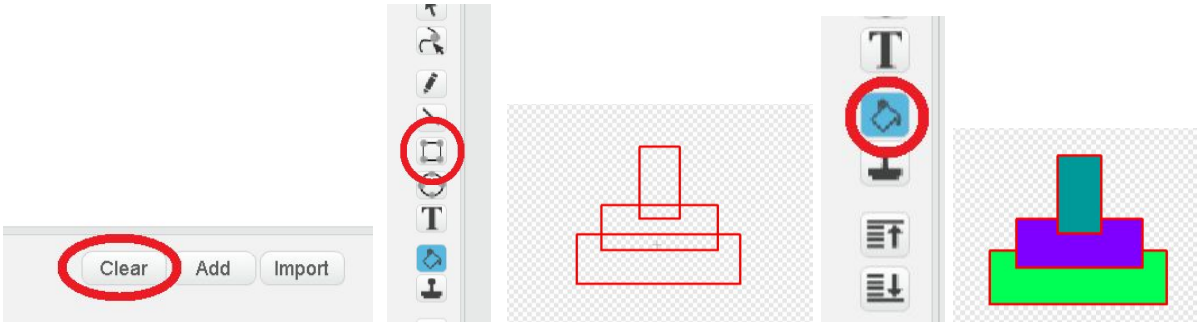
- Right click on the sprite
- Click on **Info**
- This should allow you to type a new name in, use the name **Player**.



Draw the Sprite

We can now draw our sprite.

- Click on Clear to remove the cat image.
- Select the **rectangle** tool
- Draw three rectangles as shown
- Select the **fill** tool
- Fill the rectangles with colour



Set Sprite Centre

For the sprite to collide and behave correctly, we must set the **sprite centre**.

- Select the **sprite centre** tool
- Click on the middle of the sprite to put the crosshairs there.
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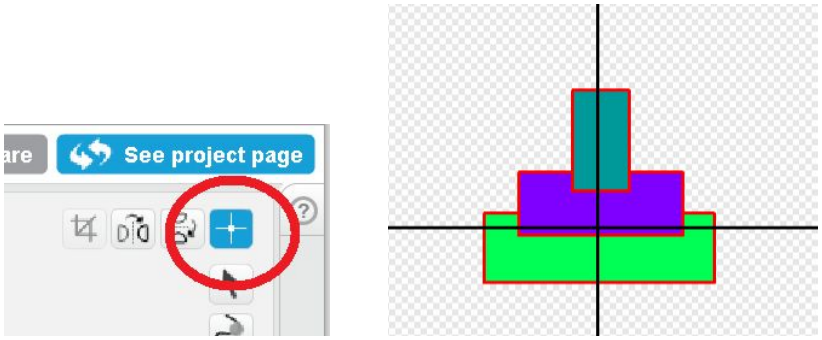
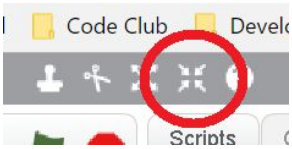
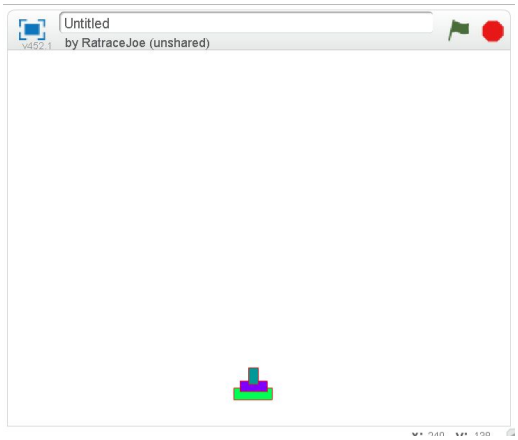


Set Sprite Size

The player sprite should be fairly small, so we will use the shrink tool and place it at the bottom of our game area. It will be shooting bullets upwards at aliens that descend from the sky.

- Select the shrink tool
- Click on the player sprite until it is fairly small
- Deselect the tool (click anywhere but the player in the game area)
- Place the player sprite somewhere near the bottom of the screen.



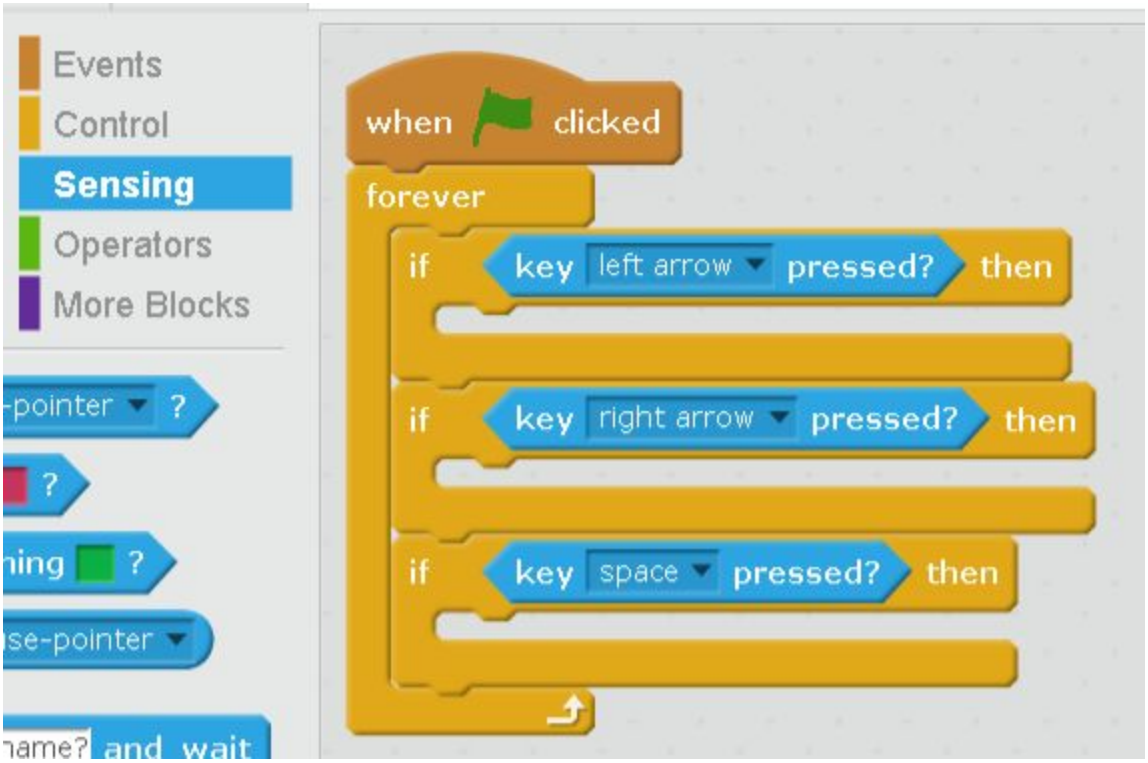


Build Keyboard Controls

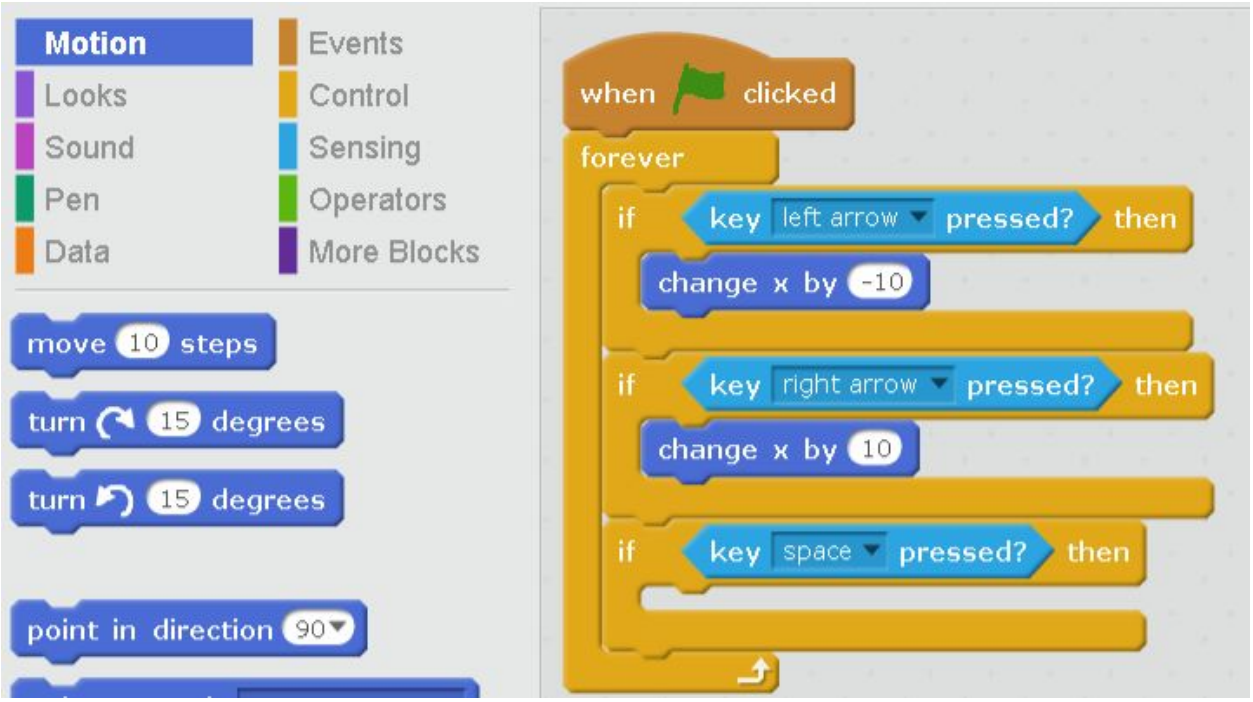
We will now build the controls for our player. The player will be allowed to move left and right, and shoot bullets. The best method for building responsive controls is to use a **forever** loop and detect each key press using an **if statement**.

- Switch to the Scripts **tab**.
- From **Events** draw a **When <Flag> clicked** block into the code area
- From **Control** drag a **forever** loop into your flag event handler.

- From **Control** drag three **if <>** block into the forever loop.
- From **Sensing** drag a **key <space> pressed?** Block into each **if statement**.
- Set the three keys to LEFT ARROW, RIGHT ARROW and leave the third one as SPACE



- From **Motion** drag a **change x by <>**block into the RIGHT and LEFT arrow key handlers.
- For the **LEFT** key, the x-value needs to change by a negative amount, use -10
- For the **RIGHT** key, the x-value needs to change by a positive amount, use +10



Create the Bullet

For the bullet we will use a simple circle.
Create a new sprite

- Select one of the pre-canned sprites to use as a bullet, I used the **Ball** here
- Right click -> Info, rename to **Bullet**
- Use the shrink tool to make the bullet a bit smaller than our ship sprite.

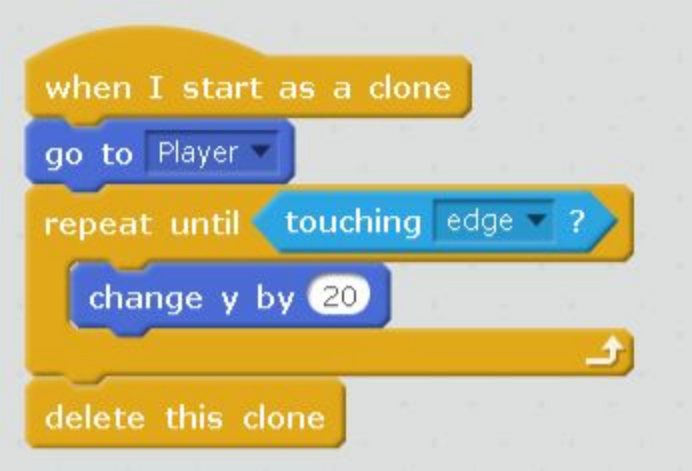
Setup Bullet Code

Bullets will be created using **cloning**. When a clone is born, it will start at the player's position and then move upwards until it hits the top of the screen. When it reaches the top of the screen it should delete itself.

- From **Control** drag a **when I start as a clone** block into the code are *for the bullet sprite*.
- From **Motion**, drag a **go to <mouse-pointer>** block into this event handler and select the **Player** sprite as the **go to** target.

- From **Control** drag a **repeat until <>** block into this event handler.
- From **Sensing** drag a **touching <edge>** block into the **repeat until <>** block. (You will may have to select **Edge** from the drop down box)

- From **Motion** drag a **change y by <>** block in and set the value to 20, this controls the speed of the bullets as they ascend to the sky.
- After the **repeat** loop, drag a **delete this clone** block. This will cause the clone to delete itself once it reaches the top of the screen.



Write code for player to shoot bullets.

We setup a button handler for the <space> bar earlier, we will now use this to spawn bullets when the player is holding the space key.

- Click on the **Player** in the sprite selection panel
- From **Control** drag a **create clone of <>** block into the **<SPACE>** event handler
- Select <Bullet> for the **Create clone** block.

Play the game

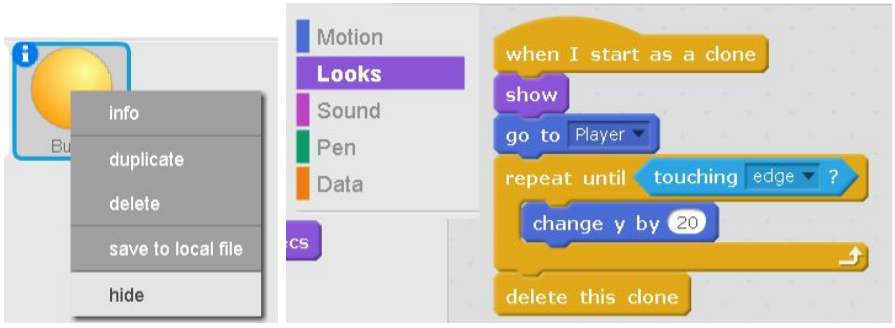
We now have enough to play with, try clicking on the green flag and moving your ship side to side. Hold down the spacebar, a stream of bullets should spew from your player, reach the top of the screen and then delete themselves.

Make sure this is working before you continue.

Fix Bullet Visibility

You may have noticed that the initial bullet sprite just sits there, this is not one of your clones, but the sprite as it exists. We should hide this sprite, and then use **show** on each of the clones.

- Right click on the Sprite in the sprite panel
- Click on **Hide**.
- From **Looks** drag a **show** block into the **when I start as a clone** block of your Bullet sprite.

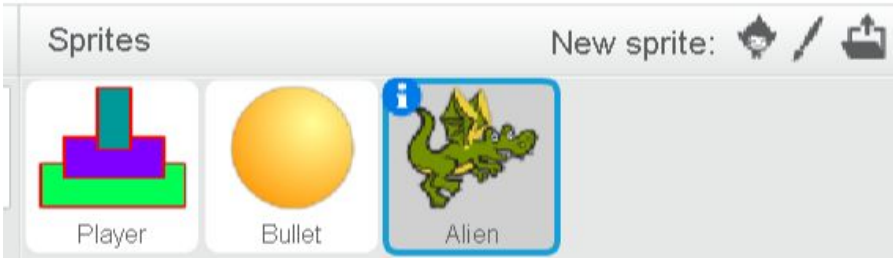


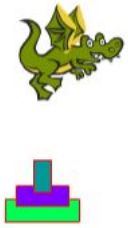
Now try playing the game again, the default bullet should be invisible, but the clones should become visible as soon as they are fired.

Create Alien Sprite

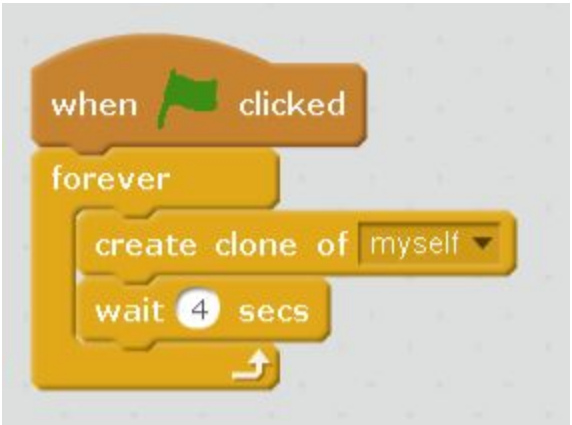
We must now create some aliens to use as enemies. These will drop down from the sky as work their way towards the player.

- Click on **Choose Sprite From Library** and select something to use as an alien costume. (I used the dragon)
- Use the shrink tool again to make the alien roughly the same size as your player sprite.
- Rename the sprite **Alien** (or enemy (dragon actually works well))





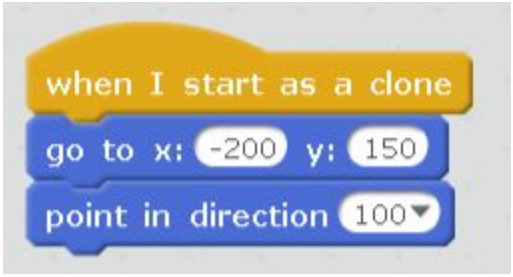
- From **Events** drag a **when <Flag> clicked** block into the **Scripts** area for the alien sprite.
- From **Control** drag a **forever** loop into the flag event handler.
- From **Control** drag a **create clone of <myself>** into the **forever** loop.
- From **Control** drag a **wait <4> secs** after the cloning.



Handle New Alien Behaviour

When a new alien is created, we want them to start at the top of the screen and scan their way down.

- From **Control** drag a **When I start as a clone** block into the **Scripts** area for the Alien.
- From **Motion** drag a **go to x:<> y:<>** block into the clone event handler.
- Set the x-value to -200 and y-value to 150, this should be somewhere in the top left of the game area.
- From **Motion** drag a **point in direction <90>** block into the clone handler. Set the value to **100** which should point the Alien at a slightly downward angle.



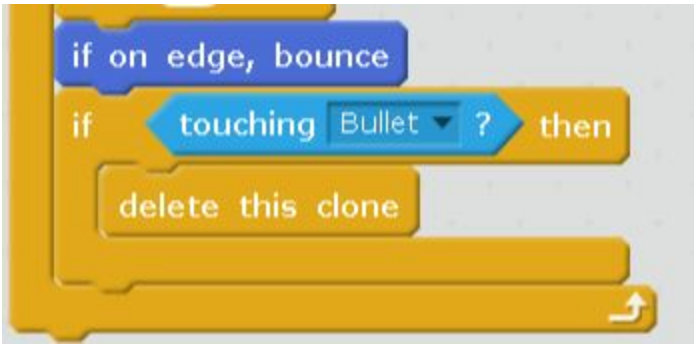
The dragon will keep moving down the screen until they get to the bottom of the screen where we can then delete them.

- From **Control** drag a **repeat until <>** block into the clone handler.
- From **Operators** drag a **less than** [] < [] block into the **repeat until** block.
- From **Motion** drag the **y position** indicator block into the less than, use the value of **-150** for the other box. This loop will keep running until the alien gets near the bottom of the screen.

Let's get these aliens moving!
From **Motion** drag a **move <10> steps** block into the loop
From **Control** drag a **wait <> secs** block in, set the value to 0.1
From **Motion** drag **if on edge bounce**. This will cause the alien to change direction when it gets to the side of the game area.

Now we must handle aliens getting hit by bullets.

- From **Control** drag an **if statement** into our loop.
- From **Sensing** drag a **touching <>** block and select **<Bullet>** from the drop down.
- From **Control** drag a **delete this clone** into the if statement, this will cause the alien to disappear if it is hit by a bullet.



Now we must delete the alien when it reaches the end of the loop.

- From **Control** drag a **delete this clone** block outside the loop.

Handle Game Over

We now need to handle the event of an enemy hitting the player. This should cause a game over and the game should stop.

- Select the **Player** sprite
- From **Control** drag an **if statement** alongside the existing button handlers.
- From **Sensing** drag a **touching <>** block into the new **if statement**
- Select the **Alien** sprite in the drop down
- From **Looks** drag a **say <Hello!> for <2> secs** block into our new if statement
- Set the value of the message to **GAME OVER** and the time to 5 seconds.

Now play the game and wait for an enemy to hit you, the game show the message and then stop. You will have to click the green flag to restart it each time.

Keep Score

We need to keep some sort of score for the player. We will use a variable to track the score, we can display it in the game area.

- In the **Data** section, click on **Make a Variable**.
- Give it the name **Score** and make sure it is **For All Sprites**.
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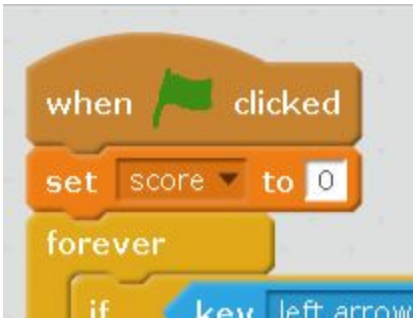
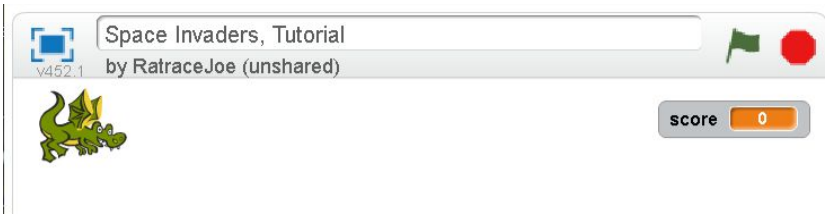
- Select the **Player** sprite
- From **Data** drag a **set <score> to 0** block into the flag handler.



A **score** variable display should have appeared in the game area, drag this somewhere sensible on the screen.



We should increment this score whenever an alien is hit.

- Select the alien sprite
- From **Data** drag a **change <score> by 1** block into the **if statement** that detects bullet collisions.

CONGRATULATIONS YOU HAVE NOW FINISHED THE BASIC SPACE INVADERS PROJECTS

Things to try

- Pick an alternative background
- Have the enemies start at a random x-value (use the **pick random** block from **Operators** in your **go to X: Y:** block in the Alien code.
- Set-up a number of different alien costumes and pick a random one for each clone
- Delete a bullet when it hits an enemy, preventing a bullet taking out multiple enemies.