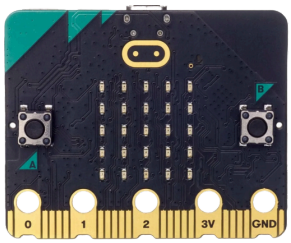
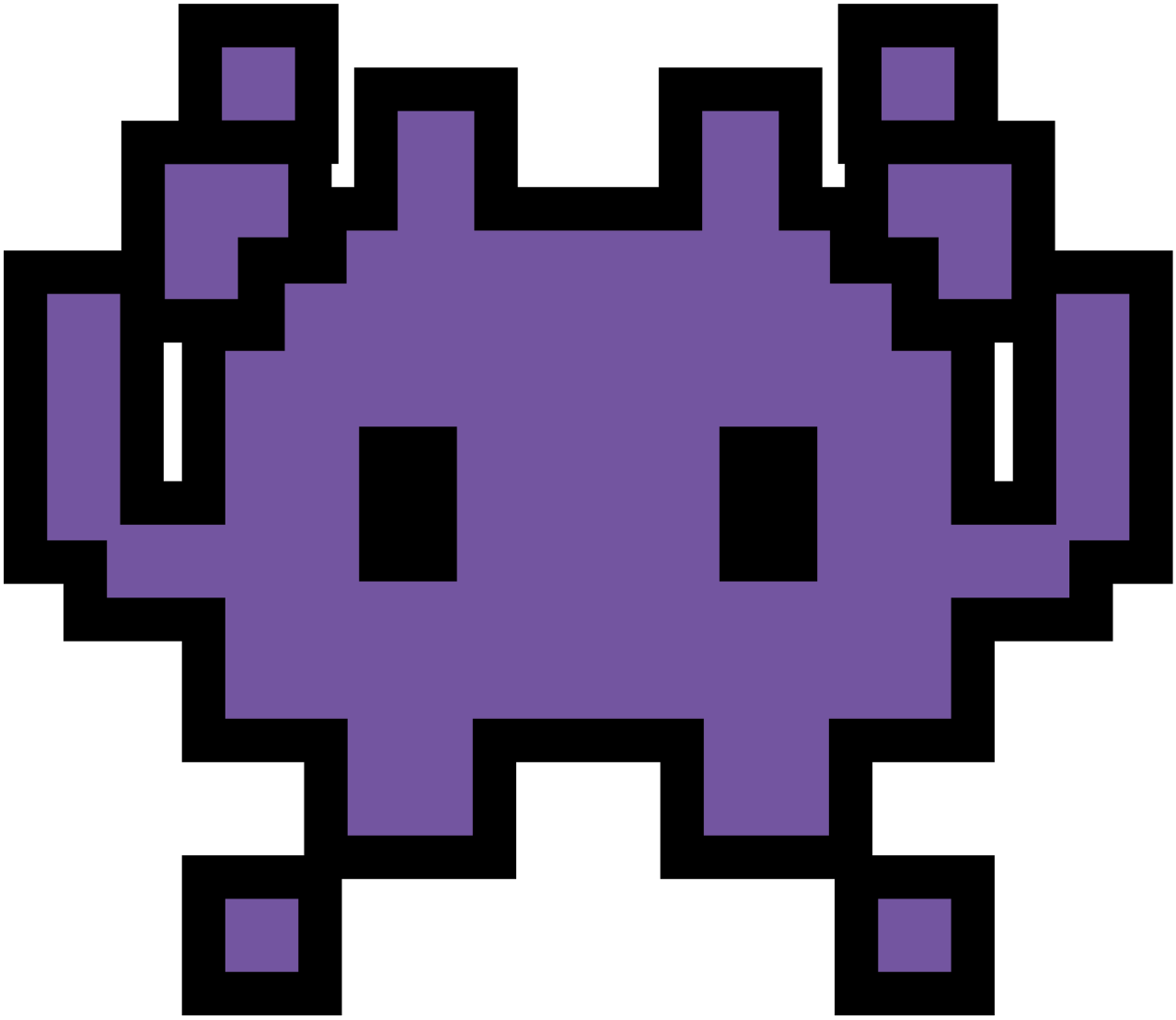


Hello!

My name is Andy and I'm going to explain how to make the classic game Space Invaders on your Microbit.



For those not aware Space Invaders is a classic game from the 1970s... yes, it's that old! This version is going to be slightly different than the classic but it'll be more fun than any PlayStation or XBox out there. Actually, I can't guarantee that, but it's not everyday you make your very own game.

First thing we'll do is create our ship and the first step to doing that is creating a **variable.** Click on the **variable menu** and **create a variable** and call your new variable **ship.**

I'd recommend remembering where that variable is as we'll be using it a couple more times whilst making Space Invaders.

Get yourself a **set ship to 0** from the **variables menu** and pop it into the **on start** block.

With our new variable in place we need to put it to use and turn it into a **sprite.** Normally this would involve a lot of code that would take us years to write but, luckily for us, makecode has done all the hard work for us.

If you go to the menu on the left-hand side of the page (I don't know why I'm telling you where it is, when you'll have already found the variable menu) and find - and click on- **advanced.** This will pop up more menu items and the one we want is **game**.

In **game** we want **create sprite at X: 2 Y: 2.** Take this, and drop it into the **0** on the **set ship to 0** block.

Keeping the numbers at X:2 Y:2 will create our ship right in the middle of our LED lights. That's because it works in as a grid (just like the Scratch game board). X is left to right and Y is top to bottom.

I'm going to set you a challenge now... get your sprite to the bottom row of the LED lights and I'll give you the answer on the next page. (Do try and work it out and don't cheat!

I will give you a hint, you only need to change one thing.

Ready for the answer?

Here it is...

As you can see it needs to be **Y:4.**

I bet you're wondering why it's 4 and not 5? Technically 5 would work but on the Microbit the LED lights are counted 0, 1, 2, 3, 4 rather than 1,2,3,4,5 and the reason for that is something to do with maths and computer science that I can't remember right now and I honestly can't be bothered to look it up.

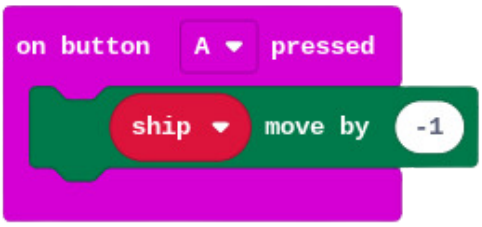
Anyway, we now have a ship which is cool, but we can make it cooler by getting it to move!

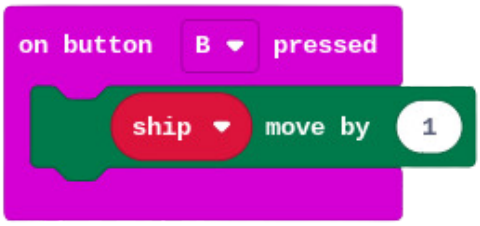
For this, we're going to use the **A** and **B** buttons. Head to the **input menu** and get two.. that's right two **on button A pressed** blocks. Once you have them both change one of the A's to a **B**. (Click the little arrow next to the letter A).

Button A is going to move our ship one LED light to the left and button B is going to move one LED light to the right.

The block we need is inside the **game menu** and is called **sprite move by 1**. Change the **sprite** to **ship** by clicking on the arrow.Pop one in each of the **on button pressed** blocks.

To move left (button A) change the number to **-1** and to move right (button B) that can remain as **1**.





Great, that's our very basic controls complete. We're now going to give the ship a laser as a weapon. I'm only using laser as an example to be completely honest, it could be a hotdog cannon in your game. Coders choice.

Let's make another **variable.** I have already told you how to make a variable but just incase, I'll give you a reminder.

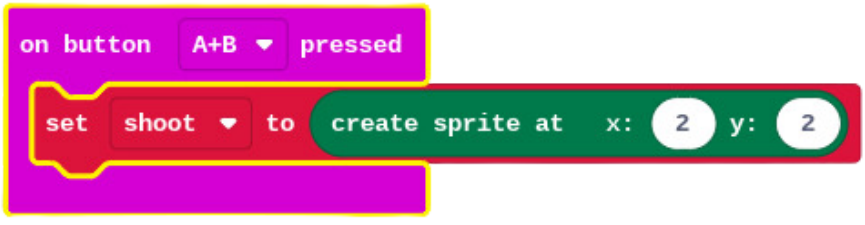
Go to the **variables menu** and click **create a variable** and we'll call this one **shoot**. I suppose you could also call it laser or hotdog or gun depending on your preference but in these instructions I'll be referring to it as **shoot.**

We're going to be making one more variable in the near future. I'll tell you know that you are on your own for that one, I refuse to explain it again for the third time.

To get our ship to shoot we're going to use the **on button A+B pressed input.** Grab yourself a **on button A** pressed from the **input menu** and click on the little arrow to change the input to **A+B.**

Take your mouse over to the **variables menu** and get a **set shoot to 0** block (there might not be an option for **set shoot to 0** but just get the one that says set to on and you can change it once it's in your code) go ahead and pop that in the **on button A+B pressed block.**

Go to the **game menu** and get a **create sprite at X:2 Y:2 block** and place it over the **0** of the **set shoot to 0** block. This will make a laser (LED light) appear in the middle of the lights when you press A+B.



This code is good, but we have a small problem. To add some much needed realism to our Space Invaders game we need the laser to spawn/appear where the ship is. If the ship is going to be moving, we can't just spawn the laser in the same place every time.

What we really need is a piece of code that will tell the laser to appear where the ship is... and luckily we have a piece of code we can use to do just that!

This piece of code is waiting for us in the **game menu** and it is called **sprite X.** We're going to need two of them. Drop them over where it says 2 on the **set shoot to create sprite at X: 2 Y:2** block.

Change the two sprites to **ship** and make them say **X** (left hand side) and **Y** (right hand side).

This will mean that the laser will always spawn with the ship is.

If you test it (which you should) you'll notice that the laser appears behind the ship and when you move the ship, the last won't disappear so after only a few clicks of the A+B button, you'll fill up the entire bottom row. This isn't what we want to happen.

We want our laser to fire upwards. And to do that we need some more bits of code... obviously. Go to the **loops menu** and get a **repeat 4 times** block and pop it into the **on button A+B pressed** block underneath the **set shoot** block. Next go to the **game menu** and we need a **change x by 1** block. This goes into the **repeat 4 times** block. Change that **X** to a **Y** and the **1** to a **-1.**

Test your code again and your laser should fire upwards after starting at the ship... or does it?

Technically it does, but it happens so quickly that our eyes can't see it moving. To our slow human eyes, it looks like the light just appears on the top line of lights ... oh and it doesn't disappear either so we now have the problem that we're filling the top light line up with red.

So that's two problems we need to solve...

When trying to solve problems it's a good idea to break them down into smaller steps. Instead of trying to solve everything at the same time. Break the bigger problem down into smaller chunks and solve the smaller chunks one and at a time. This is called decomposition if you wanted a fancy word for it.

Let's start with getting the laser to fire so our human eyes can see it moving...

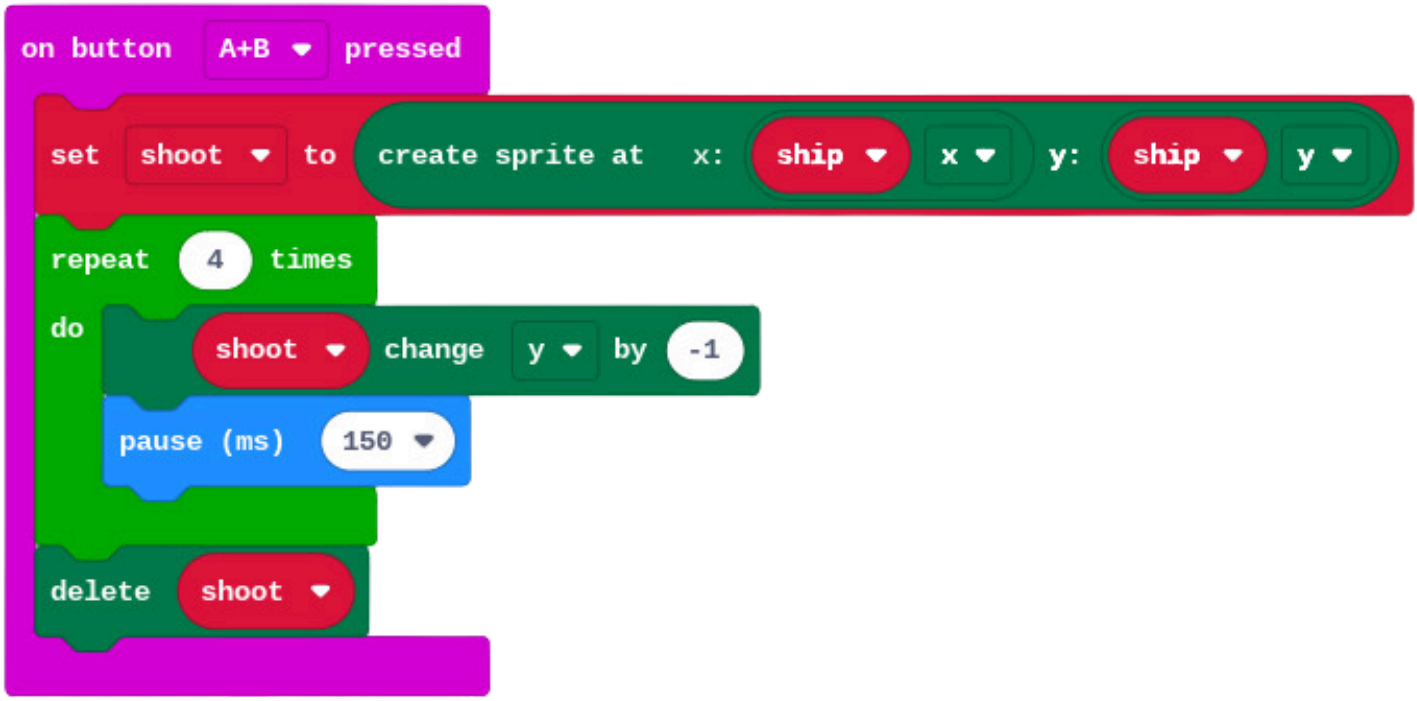
The solution to this is getting the laser to slow down as it fires so we can see it moving. For this, go to the **basic menu** and get the **pause (ms) 100.** Drop this into the **repeat 4 times** block underneath the **shoot change y by -1.**

This will make the laser pause for 100 milliseconds everytime it moves up one light.

I'd recommend slowing the laser down as well so change the **100** to **150.**

Onto the next thing to solve. We need to get the laser to disappear when it reaches the top row. What this really means is that we want to delete the laser when it reaches the top.

Go to the **game menu** and you'll find a **delete sprite** block. Add this underneath the **repeat 4** block and change the **sprite** to **shoot.**



Test your code again and you'll see that your laser starts in the same place your ship is and deletes itself (disappears) when it reaches the top level.

Let's just take stock of what we've done so far - not because I think you've forgotten but so I can ramble for a little bit and use up the rest of the space on the page so I can start the next stage of instructions on a fresh page for no reason whatsoever other than I want to. You can go ahead and skip to the next page unless you are - for some strange reason- enjoying me rambling about absolutely nothing in the two thirds of the way (yep still one third to go!) through an instruction booklet.

Anyway...

We have a ship that can move left or right depending on which button we press A or B and we've added a laser which will start at the ship and fire to the top of the lights before deleting when you press A +B.

I think I've used enough of the page now... so I'll stop rambling and actually get on with telling you how to make Space Invaders.

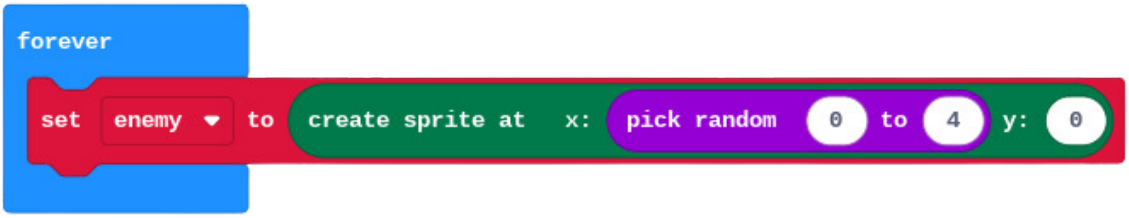
It's time to add our asteroids or enemies if you prefer to think of it that way. For the start of this code we need the **forever block**. Just in case you deleted it at the beginning you'll find it in the **basic menu** if you need to get a new one.

It's time to make another **variable.** You know how to do it by now. This variable is going to be called **enemy.**

Then get yourself over to the **game** menu and get a **create sprite at X:0 Y:0** block. Then in the **forever loop** add **set variable to** block from the **variable menu** and change the variable name to **enemy** and pop the **create sprite** over the **0.**

I'm all for making games easy (because I'm rubbish at them) but at the moment our enemy (in this case an asteroid) in the form of a red light will always appear in the same place. Let's add a little random to the code.

In the **math menu** (that's American- we in the UK call it maths) there is a block called **pick random 1-10** and that's the block we're going to need. Drop the **pick random 1-10** over the **0 next to the X.** Then change the number **10** to a **4.** That **Y number** needs to be **0** as well.



This means that when our enemy spawns it will choose one of the 5 lights on the top row to spawn in which means we'll never know exactly where the enemy will spawn.

This next bit sounds strange... well stranger than I normally sound.

The enemy is currently facing the wrong way round. I told you it sounded strange. How could a light be facing the wrong way? It's a light...

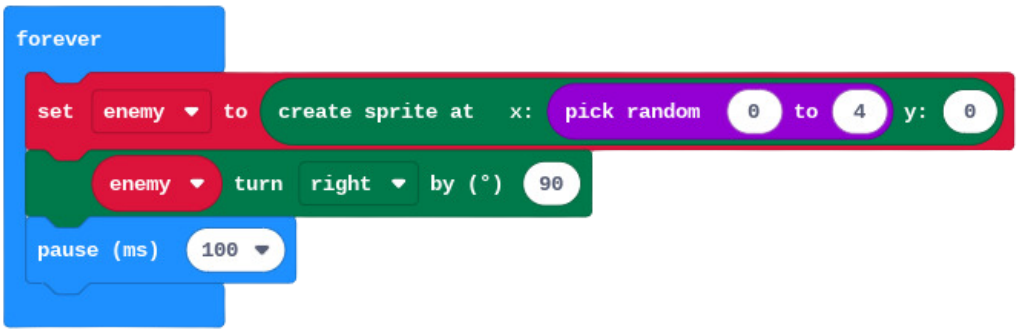
While you ponder that question, let me explain. Currently the light is facing to the right of the Microbit and we need it to be facing the bottom of the Microbit... basically we need the light to turn to the right.

Handily there is a block for this.

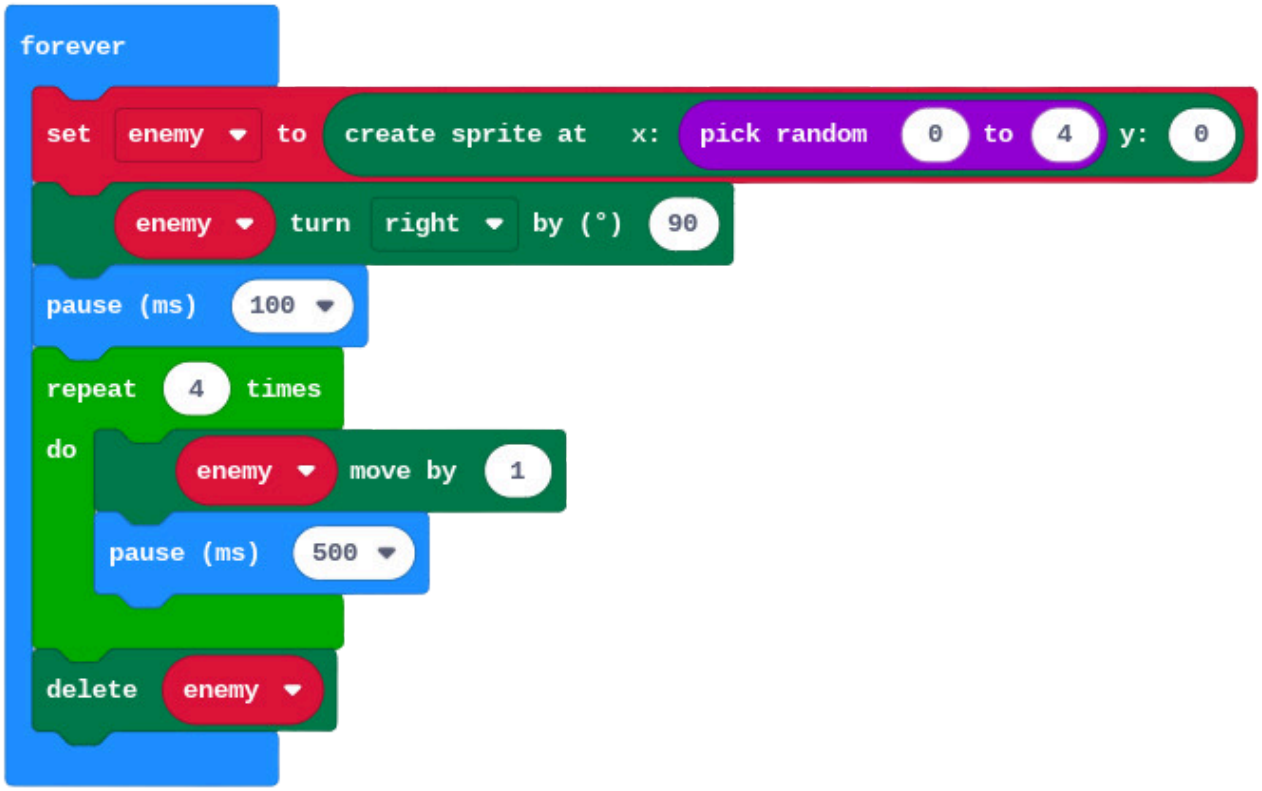
Go to the **game menu** and find a block that says **sprite turn right by 45.**

Change the **sprite name** to **enemy** and the **45** to **90** and pop it it the forever loop. This will make the enemy face the bottom of the Microbit when it spawns in.

For the next bit we're going to do the reverse code to the laser firing upwards from the ship. To help our eyes, let's add a pause to the code. Grab it from the **basic** menu and drop it under the **enemy turn right by 90**. It can stay at **100 milliseconds.**



Then the code will look pretty much the same (I believe 2 numbers change) as the code we made for the laser. Rather than going through every step, here's an image of the completed code - just look earlier in the instructions if you've forgotten where any of the blocks are.



After what feels like 400 pages we are very nearly there. The last things to add is a way to destroy the enemy ... well code the laser to destroy the enemy, a way to increase the score and a way for the player to lose the game.

The first step to do this is telling the game that if the **enemy hits the ship** we want it to end the game because the enemy has blown up the ship.... a game over if i've ever seen one.

Go the the **logic menu** and get two **if then blocks**. We then need to go to the **game menu** and get a **game over block** and a **is sprite touching** a **game over, delete sprite** and **is sprite touching edge.**

Last stop is the **variable menu** where we need a **ship** block - just the one that says **ship.**

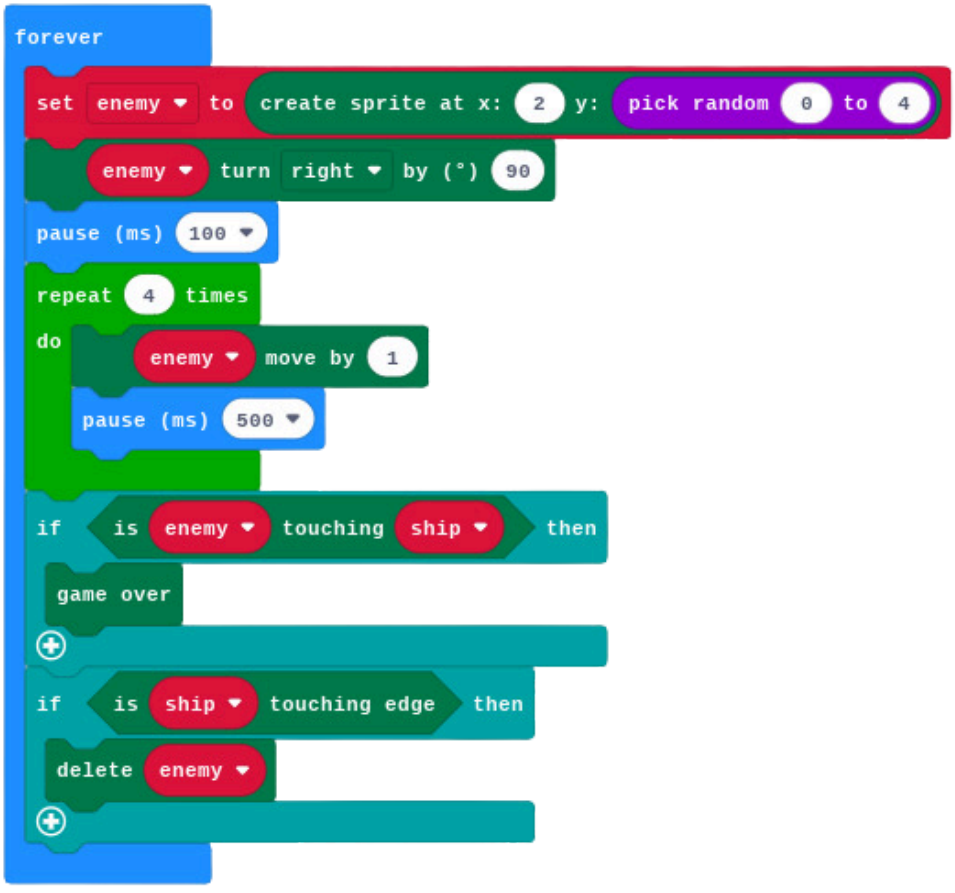
These blocks are going to go inside the **forever block** underneath the **repeat 4 times.** But the **is sprite touching** and **is sprite touching edge** inside the gaps inside the **if then blocks** and change the name of **sprite** to **enemy.**

Next, take the **ship block** and place it in the empty spot next to **is enemy touching.** So it reads **is enemy touching ship then.** Inside this one but the **game over** block we placed earlier.

Inside the other one put the **delete sprite** and change **sprite** to **enemy.**

You should now have two blocks- one that reads **if is enemy touching ship then game over.** And the another one which reads **if is enemy touching edge then delete enemy.**

Here's an image... it probably would have been easier to use it straight away than trying to describe it.



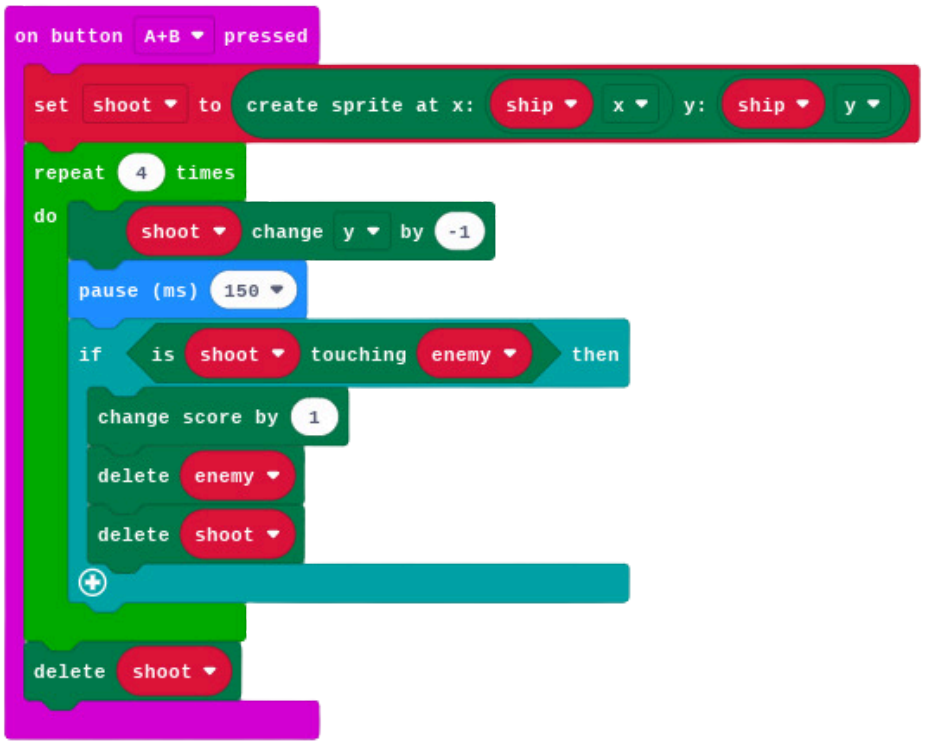
Okay, one last bit of code to add and the final bit we're putting in is the scoring mechanics of the game. It's going to go in the **on button A+B pressed block** of code.

Go to the **logic menu** and get a **if then** block and place it under the **pause (ms) 150** in the **repeat 4 times block.**

In the gap in between the **if** and **then** put a **is sprite touching** block from the **game menu**. The name **sprite** needs to be changed to **shoot** and finish that line of code go to the **variable menu** and get an **enemy block.**

Inside the **if shoot touching enemy then block**, place a **change score by 1** and two **delete sprite blocks** which you'll find in the **game menu** as well.

Change one of the **delete sprites** to **delete shoot** and the other one to **delete enemy.** This means that when you blow up an asteroid with a laser from your ship, you will get one point and both the laser and asteroid will be deleted so new ones can spawn in.



Actually, I release now I lied when I said that was the last bit of code. In the **on start** block go to the **game menu** and get a **set score to 0** block to put underneath the **set ship to create sprite at x: 2 y: 4 block.**

And that is how you can make Space Invaders on the BBC Microbit! Here's what all the code should look like. Just download it onto your Microbit and have fun! Let me know what your top score is.