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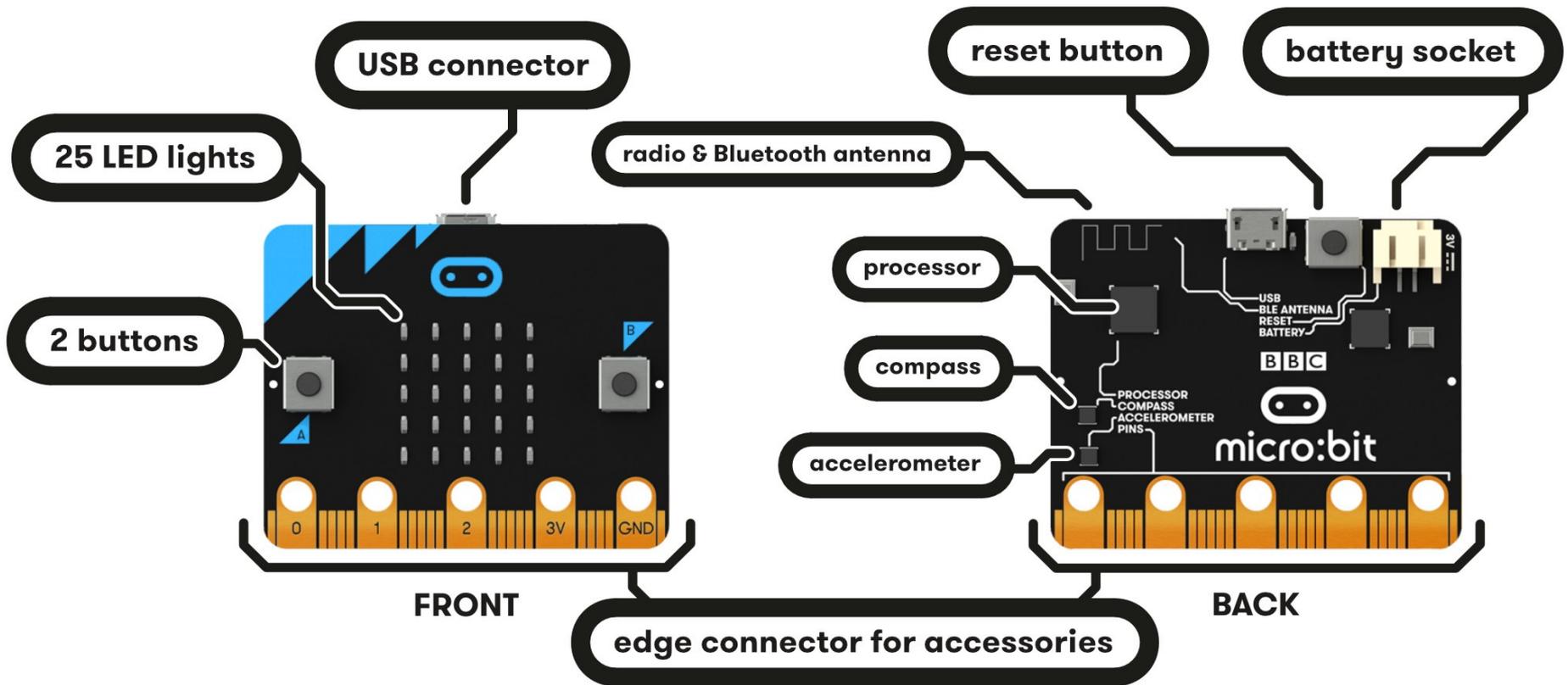
Helping Animals micro:bits



Intro to micro:bit

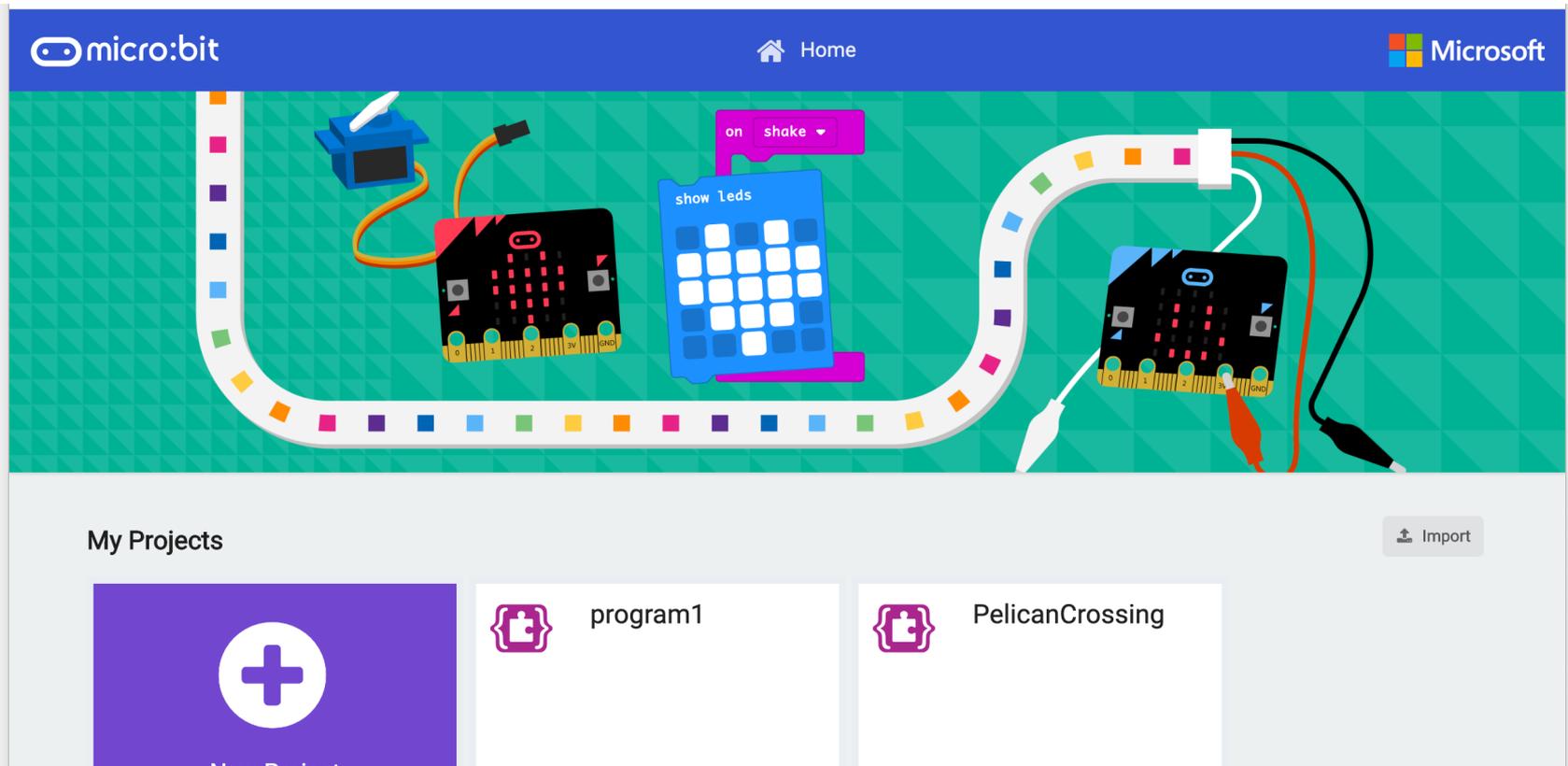


What is a micro:bit?



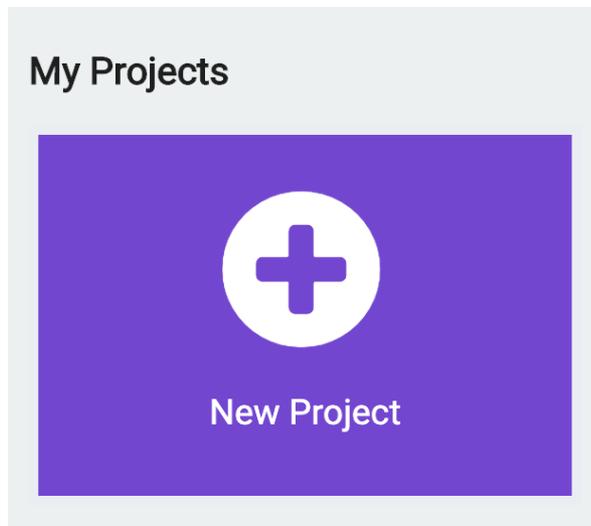
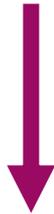
Starting with MakeCode

makecode.microbit.org

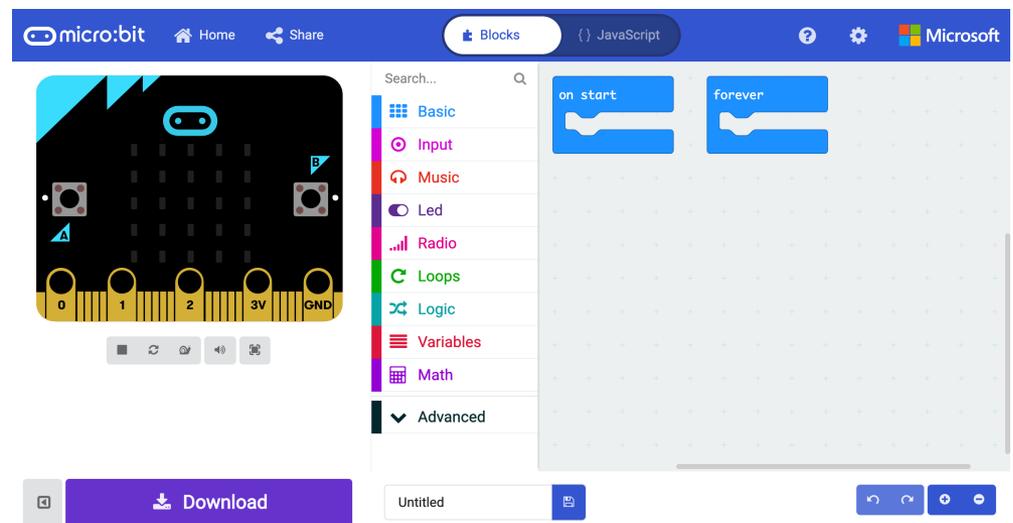


Starting with MakeCode

Click New Project



It should look like this!



Simulator

Language

The screenshot shows the Microsoft MakeCode micro:bit editor interface. At the top, there is a blue navigation bar with the 'micro:bit' logo, 'Home', 'Share', 'Blocks', and 'JavaScript' tabs. Below the navigation bar, the interface is split into three main sections. On the left is the 'Simulator' window, which displays a virtual micro:bit board with various components like the LED matrix, buttons, and pins. Below the simulator are icons for running, refreshing, and saving. In the center is the 'Code Window', which is a block-based editor. It contains two blue blocks: 'on start' and 'forever'. On the right is a sidebar with a search bar and a list of categories: Basic, Input, Music, Led, Radio, Loops, Logic, Variables, Math, and Advanced. At the bottom left, there is a purple 'Download' button. At the bottom right, there are icons for undo, redo, and zoom in/out. The text 'Save and Download' is written in green below the 'Download' button, and 'Code Window' is written in green below the block editor area. Red arrows point from the labels to the corresponding elements in the interface.

Save and Download

Code Window

Connecting the micro:bit

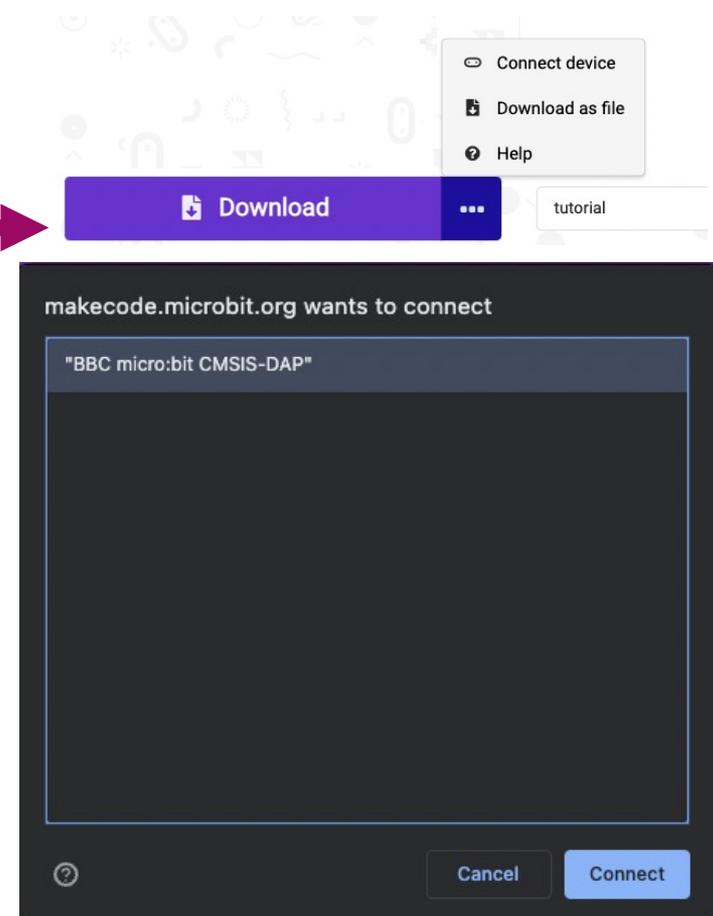
1. Plug the micro:bit into your computer

2. In the bottom left of your screen, click the 3 dots next to 'Download', then click 'Connect Device'

3. Follow the on-screen instructions until you see this popup

4. Click the name of your device (it should be the only option)

5. Click connect



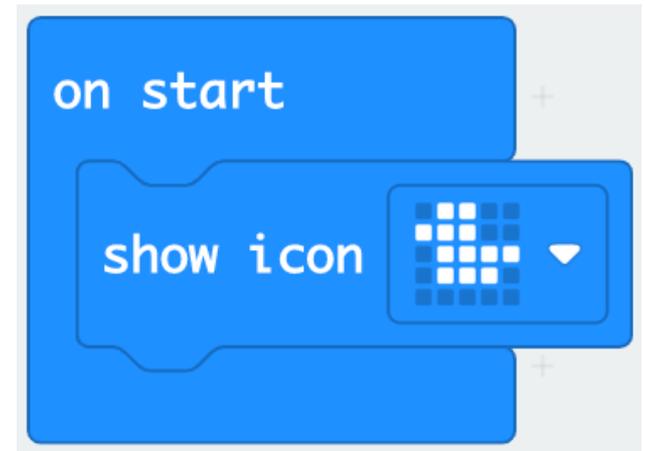


Activity: Animal Icons

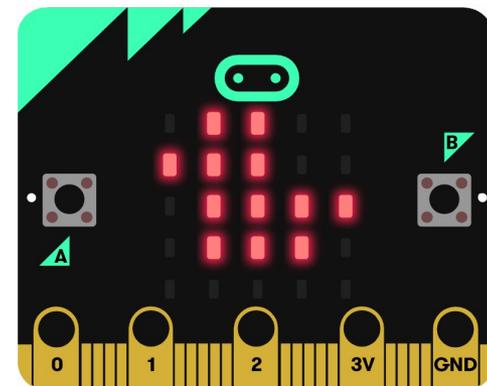
Animal Icons

Let's start by displaying a picture:

1. Click on basic
2. Click on the show icon command
3. Drag and drop it into the forever block
4. Use the dropdown menu to change the icon - choose your favourite!
5. Click on download



What happens to the micro:bit?
Try changing the icon!

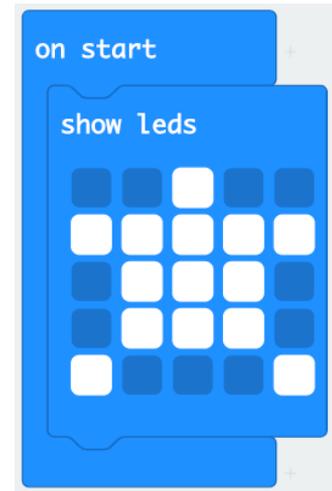
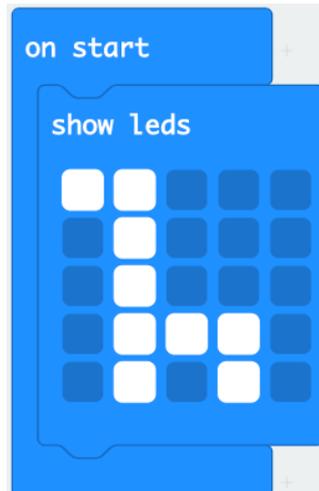
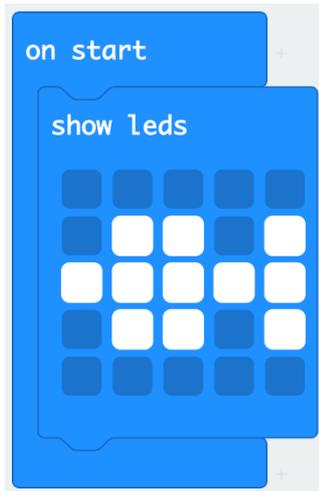


Animal Icons

The `show leds` command lets us choose exactly which LED lights we want to light up.

This can be used to create your own icons.

See which animals you can make. Remember to click download!





Activity: Animated Animals

Loops

- Loops allow us to repeat commands.
- They can be repeated forever, for a certain number of times, or for a given condition.
- These commands are found in the [Loops](#) section

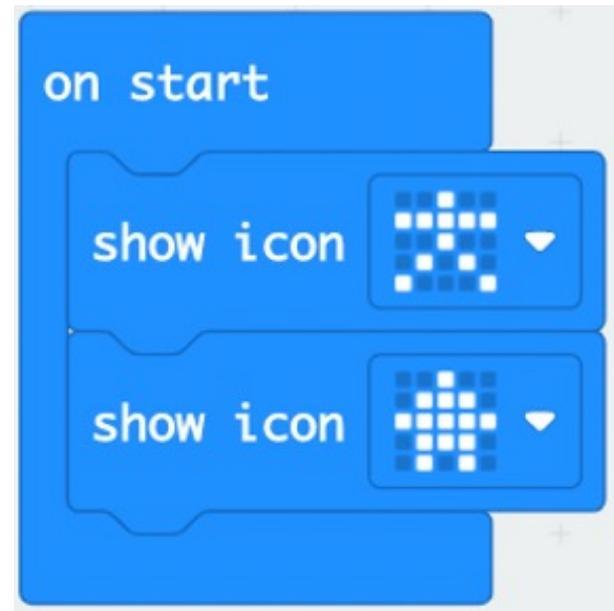
Default Loop

- We have a default loop command when we start the micro:bit project – the forever loop.
- The forever loop runs a set of commands until the micro:bit is unplugged or reset.
- You can only have one forever loop in the micro:bit code.



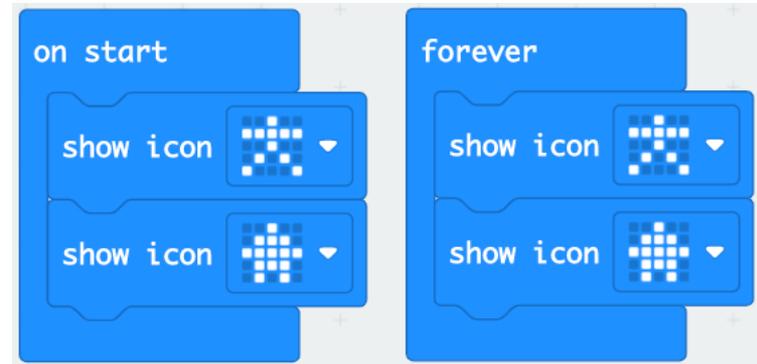
Animation

- We have already created an application which shows an animal icon on the micro:bit.
- Now we can extend our application to show an animation.
- Add a second icon after the first one.
- What happens when you download the program onto the micro:bit?



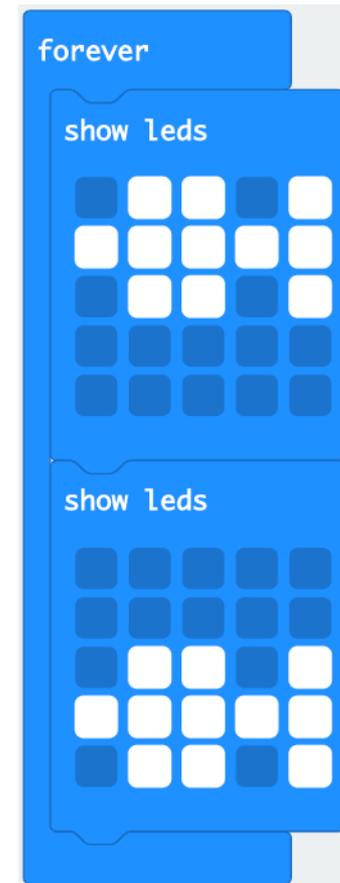
On Start vs Forever

- `on start` will run the code as soon as the micro:bit starts and ends once the code ends.
- `forever` will run the code well...forever.
- Try these two examples. What happens differently when you put the code in the `on start` loop instead of the `forever` block?



Make Your Own Animation

- So far, we have used the default icons to create our animations
- Try using the `show leds` command you saw earlier to make your own animation.

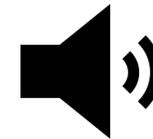
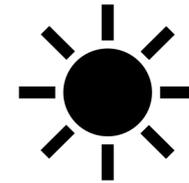


Activity: Micro:bit Sensors



Micro:bit Senses

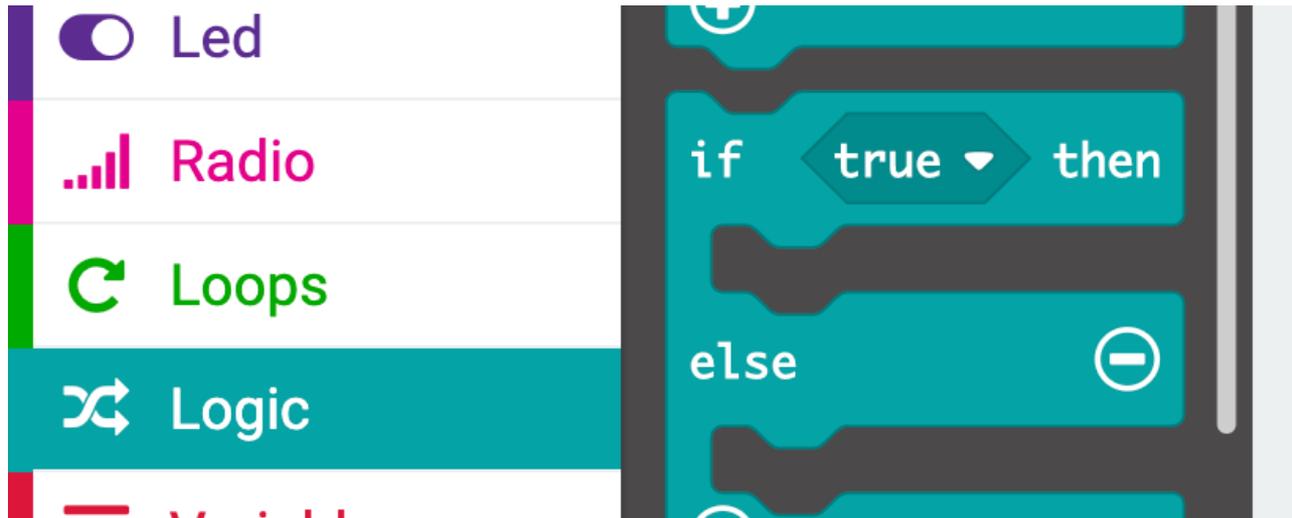
- The micro:bits have sensors in them that can detect light, sound, movement, and temperature.
- We can use this input to tell the micro:bit to do different things under different conditions.
- For example, if it gets too dark the micro:bit lights can turn on.
- To do this we use conditionals.



Conditionals

- Conditionals help us perform different actions based on different conditions.
- For example:
 - **If** my homework is done, **then** I can go outside to play.
 - **If** I have eaten my dinner, **then** I can have dessert.
- Can you think of some more examples?

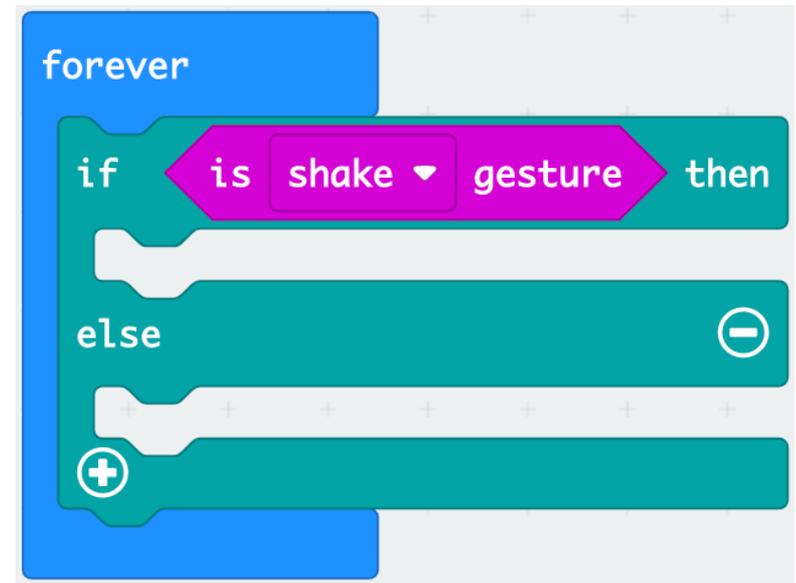
Logic



- In MakeCode these conditional statements are found under [Logic](#) section.
- Let's try to make a light that senses movement.

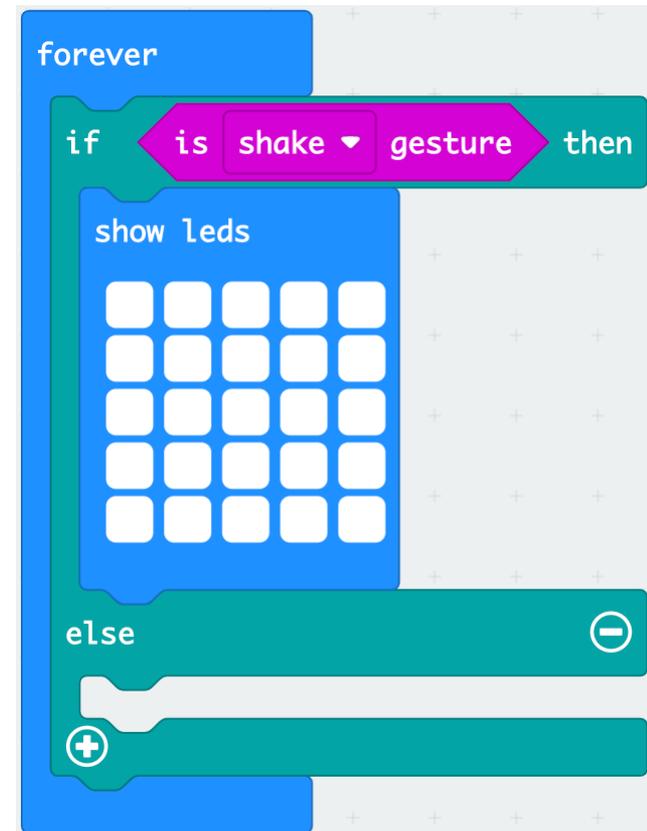
Shake Sensor

1. Drag and drop the `if true then` block into the `forever` block from the logic section.
 2. Drag the `is shake gesture` command into the `if` block
- What do you think we need to add to the code next?



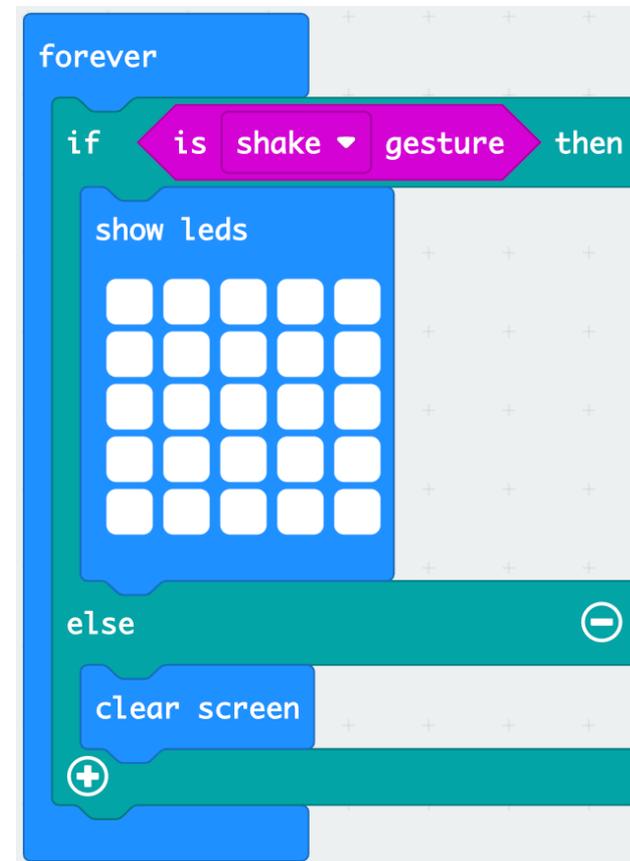
Shake Sensor

3. Add the `show leds` command to your code. Make any pattern you want.
- Try running the code and see what happens.
 - Can you find a problem with the program?



Shake Sensor

4. Add a `clear screen` command. This will stop the micro:bit lighting up when you don't shake it.





Sea Turtles

Sea Turtles

- Sea turtles are reptiles that live in oceans all around the world.
- There are 7 species.
- They can eat seaweed, seagrass, jellyfish, etc.
- Young turtles spend their time in the open ocean but when they get older, they move closer to the shore.
- Adult females will return to the land to lay their eggs on beaches.



Sea turtle problems

- Many sea turtle species are in trouble and their populations are falling.
- Why do you think this may be?
- How do you think humans have affected sea turtles?

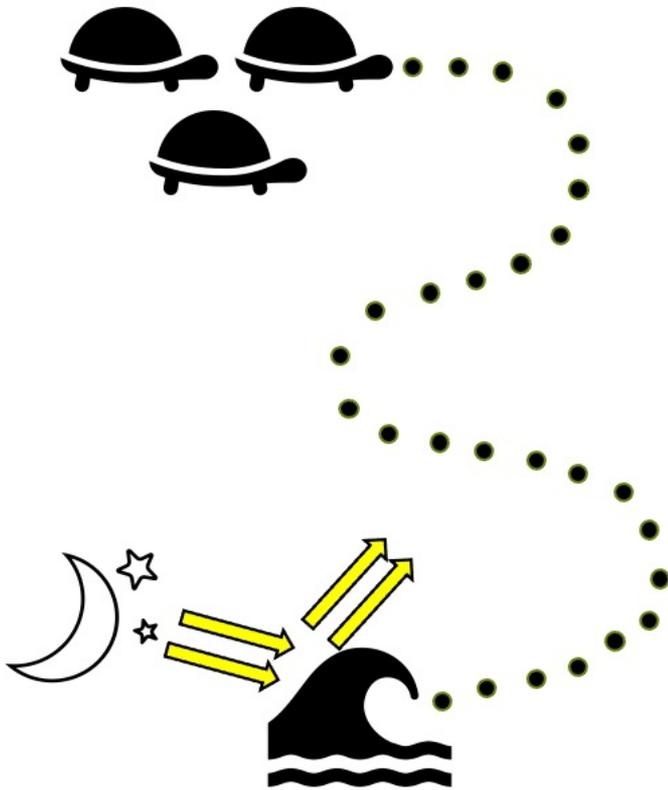


Sea turtle problems

- Many sea turtle species are in trouble and their populations are falling.
 - Why do you think this may be?
 - How do you think humans have affected sea turtles?
-
- Habitat loss
 - Fishing
 - Plastics in the oceans
 - Climate change



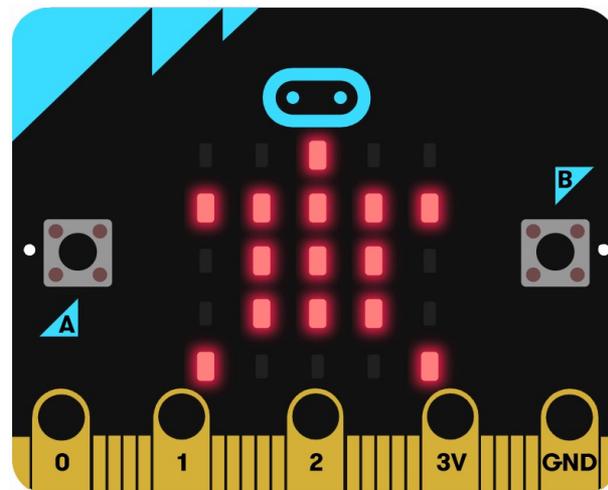
Sea Turtle Hatchlings



- When the eggs on the beach have hatched, the young turtles make their way to the sea in search of food and shelter.
- They use the moonlight and stars reflecting off the water to guide them to the ocean.
- Bright lights used by humans can confuse the turtles causing them to get lost.
- Can you think of a way to solve this problem?

Sea Turtle Lights

- Instead of strong lights like lamp posts and torches, we can use turtle-safe lights to guide humans around turtle nesting beaches.
- We can program the micro:bits to display red low wattage lights that can be placed along the ground. They are bright enough to guide humans without confusing turtles.

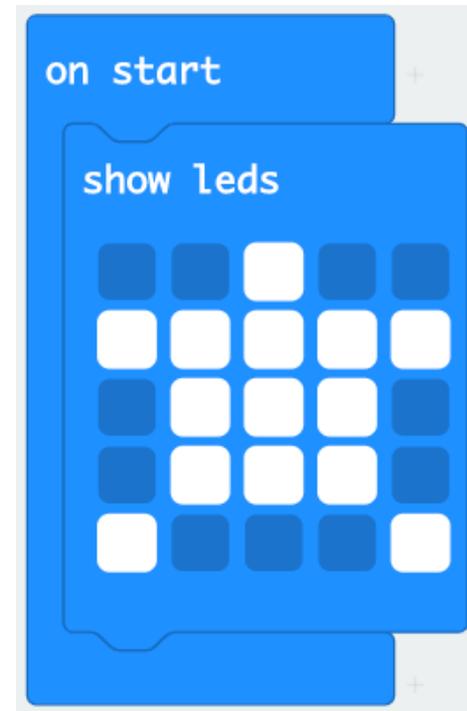




Activity: Turtle Light Sensors

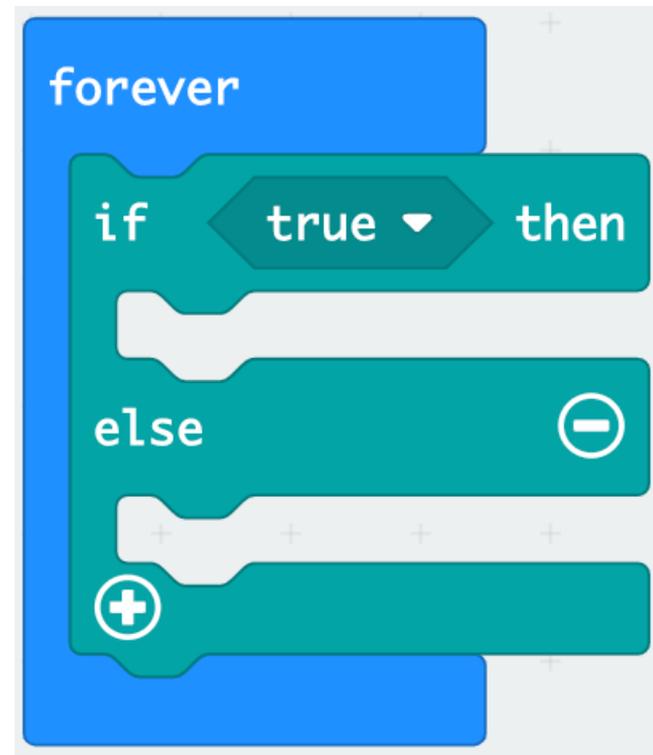
Turtle Lights

- Start by creating a turtle icon that will light up on the micro:bit
- How can we make the micro:bit only light up during nighttime?
- Hint: Think about the sensors you learnt about earlier.



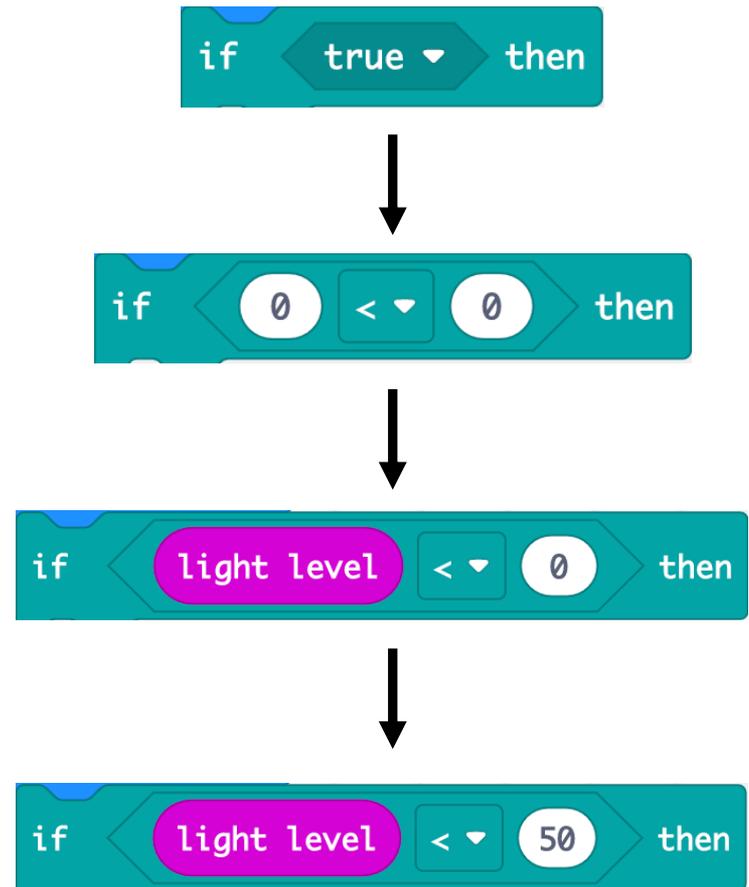
Turtle Lights

1. Start by dragging and dropping the `if true then` block into the forever block from the logic section.



Turtle Lights

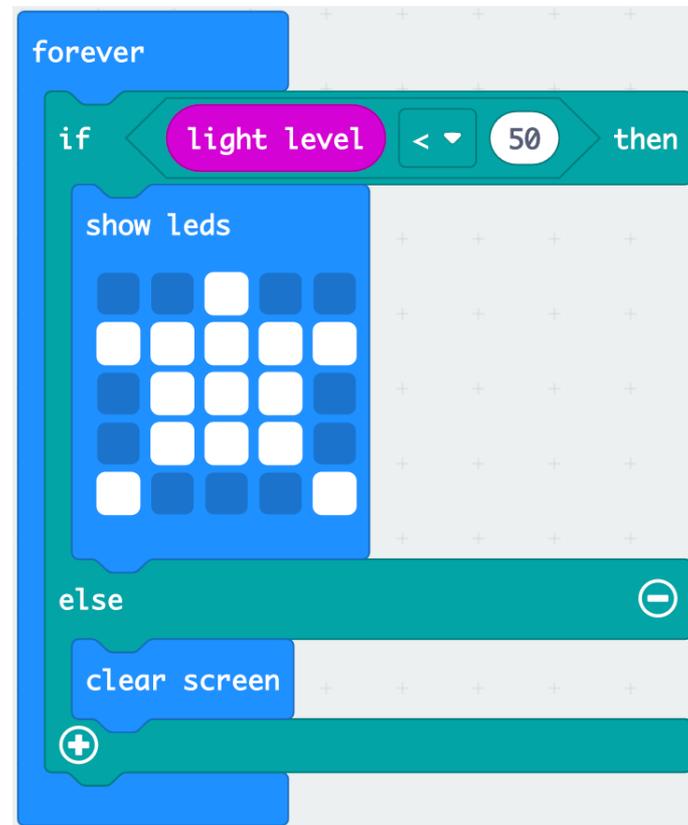
2. We need to program the micro:bit to react to the light level. Add the `0 < 0` command.
3. Add the `light level` command and change the number to 50.



Turtle Lights

4. Add the `show leds` and `clear screen` commands.

Try running the code. Can you get the micro:bit to light up?





Fishing Bycatch

Bycatch

- Big fishing boats send out huge nets that can catch thousands of fish.
- Sometimes the wrong species get caught up in the nets – this is called bycatch.
- Animals such as dolphins, turtles, and birds can get accidentally caught in fishing nets.
- How do you think we can prevent this?



Bycatch

- Big fishing boats send out huge nets that can catch thousands of fish.
- Sometimes the wrong species get caught up in the nets – this is called bycatch.
- Animals such as dolphins, turtles, and birds can get accidentally caught in fishing nets.
- How do you think we can prevent this?
- Using specially designed nets that allow larger animals to escape.
- Alerting other animals of the nets so they can avoid them (using light or sound).



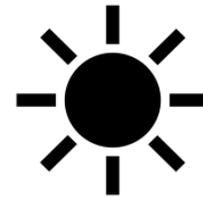
Activity: Fishing Net Lights



Fishing Nets Lights

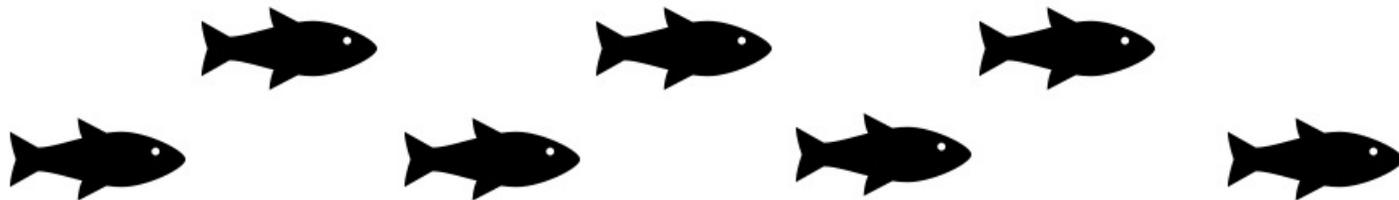
We want to program a micro:bit that lights up when underwater so that fishermen can see into the nets and make sure they are not catching any bycatch. The lights can also deter some species (like birds and turtles).

Which sensors on the micro:bit can we use to determine whether the micro:bit is underwater?



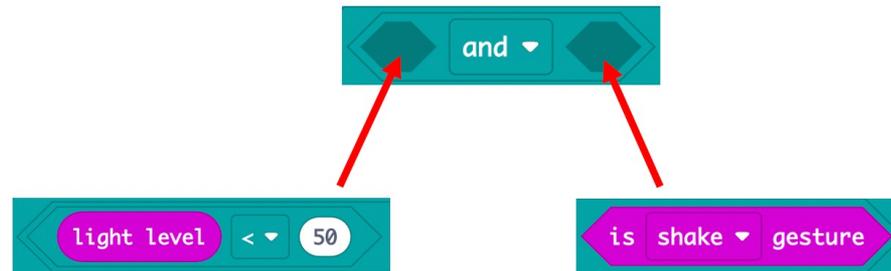
Fishing Net Lights

- Light - depending on the depth of the nets, they might not receive as much light as they would above the water.
- Movement – the waves and currents can shake the nets around.
- Temperature – if we measure the temperature of the water, we can program the lights to turn on when it is cold.



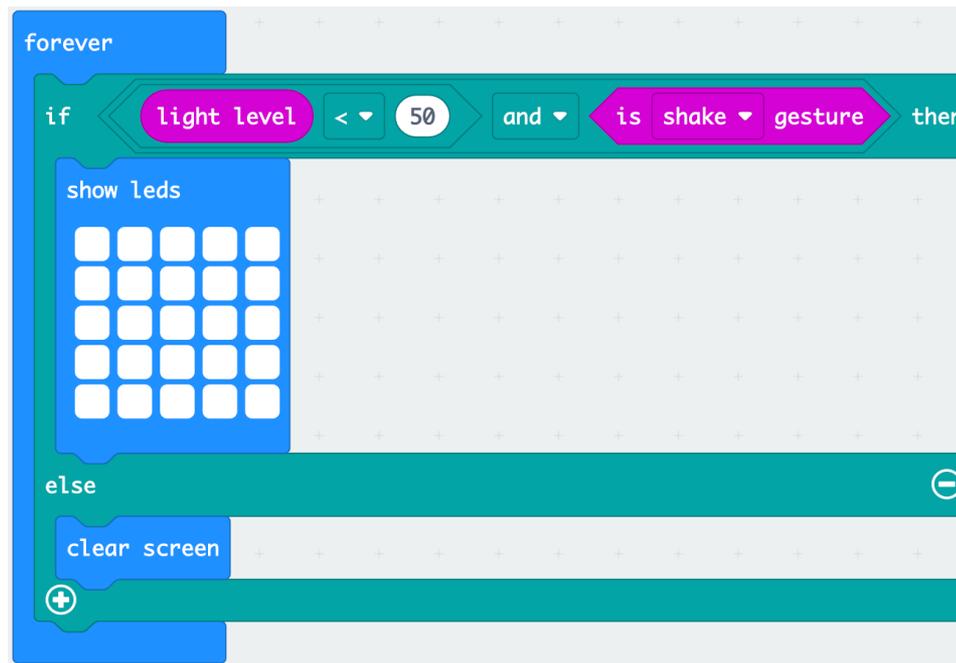
Bycatch Solutions

- Let's try to program a micro:bit light using the movement and light sensors.
- You have already made one light that responds to movement and one that responds to darkness. Now we need to make a light that responds to both at the same time
- You will need to use an **and** command found in the **logic** section. Add both the **light level** and **is shake gesture** commands to the **if** block



Bycatch Solutions

Here is a program that will cause the micro:bit to light up when it shakes, **and** the environment is dark.



Land Animals



Land Animals

- There are an estimated 6.5 million species of land animals on Earth. Only about 25,000 of these live in the UK.
- There is a huge variety of animals – mammals, birds, insects, reptiles, amphibians, etc. Which do you think is the most common?
- Rainforests have the biggest diversity of animals, but they are found in deserts, grasslands, and polar regions.



Animal Problems

- Can you think of some issues animals face that are caused by humans?

Animal Problems

- Can you think of some issues animals face that are caused by humans?
- Climate change
- Habitat loss
- Poaching and illegal trade
- Plastics and other garbage
- Pollution
- Can you think of some more?
- Which of these apply to animals in the UK?



Activity: Local Animals

Helping Local Wildlife

- Even though the UK only has a small fraction of the world's animals, they still face threats.
- Climate change, pesticides, plastics, urbanization, and pollution all affect UK animals.
- We don't always know which animals are at threat so it's important to keep track of populations.
- Can you think of how we could do this?



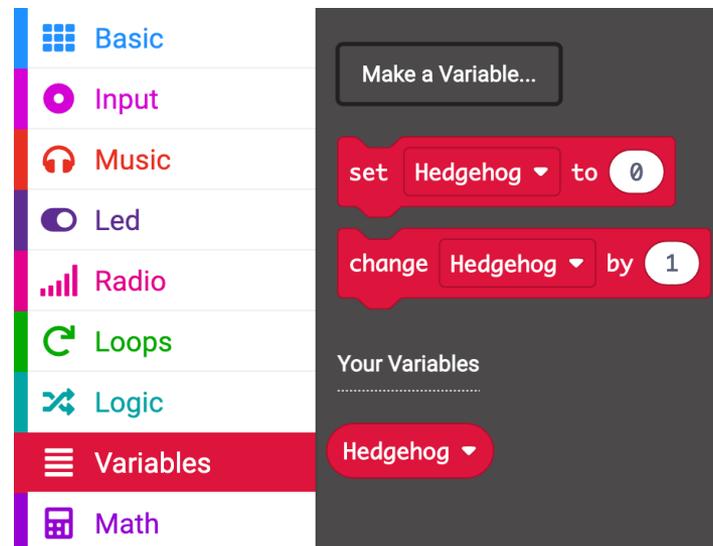
Micro:bit Species Counter

- We can program our micro:bits to act as a counter. We can use this to count species in our local area.
- This will give us an estimate of the number of animals in the area.
- If we do this over a longer period, we can see how the populations change, and which animals are declining.



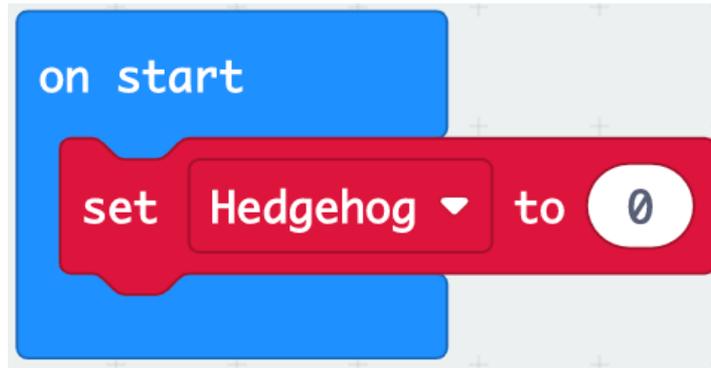
Micro:bit Species Counter

- To program a counter, we need to create a variable for the animal we want to investigate.
 - You can find this in the **Variables** section
1. Click on 'Make a Variable' and choose an animal to count. Some new commands should now show up in the **Variables** section.



Micro:bit Species Counter

2. Drag the **Set ... to 0** command into your **on start** block.

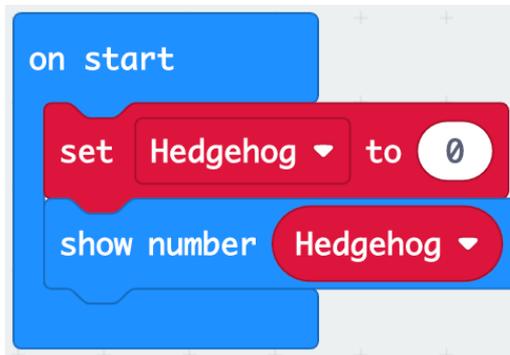


Your variable will now be set to 0 when you download the program, but we want the micro:bit to display this number.

How could we do this? (Hint: Look in the [Basics](#) section)

Micro:bit Species Counter

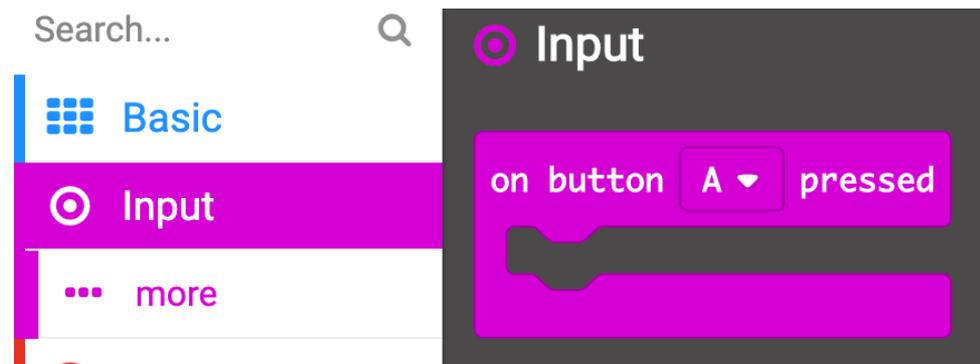
3. From the [Basic](#) section, add the [show number](#) block to your code
4. Drag and drop your animal from the variables section into the [show number](#) block.



- What happens if you run your code?
- Next, we need to program the micro:bit so that you can change the number when you see an animal.
- We can do this using events.

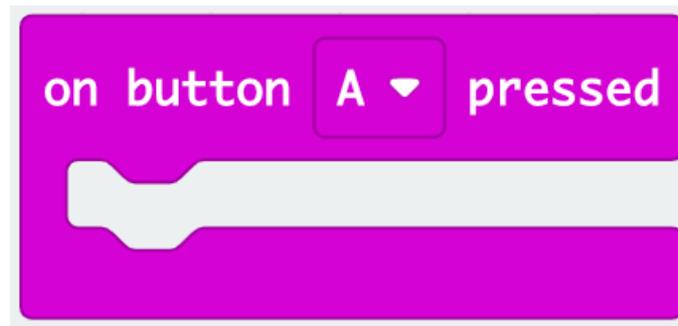
Events

- Each micro:bit has two buttons, A and B.
- These buttons help us choose which action to take without reprogramming the micro:bit each time.
- For example, we can increase the number on the counter by one every time we press button A
- The commands we need are found in the **input** section.



Micro:bit Species Counter

- What do you think we can add to the **on button A pressed block** to make our species counter?
- Hint: see what other commands are in the **Variables** section



Micro:bit Species Counter

- Add the **change...by 1** command and another **show number**.
- Try running your code to see what happens!

