

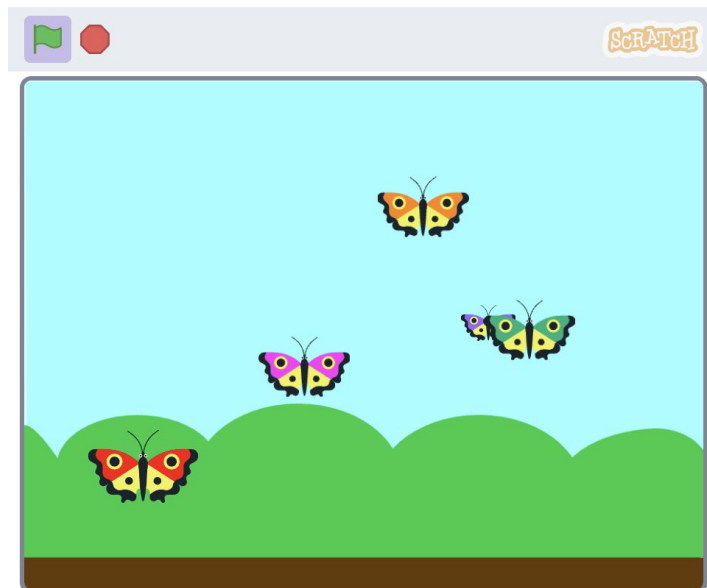
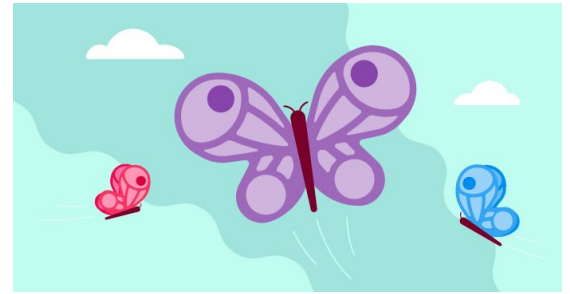
# Butterfly garden

## Project Outline

Watching nature is a brilliant way to relax, but wildlife doesn't always come along when you want it to. In this project, you will make a butterfly garden where each butterfly flies in exactly the pattern you tell it to.

You will learn to use-

- **motion** blocks to create animated butterfly sprites
- The **forever** loop to make the butterflies fly repeatedly in the same pattern
- The **Paint editor** to customise sprites costumes and create your own unique butterfly sprites



## Section 1 - Adding a flying butterfly

First, you will add a butterfly that flies left and right across the Stage.

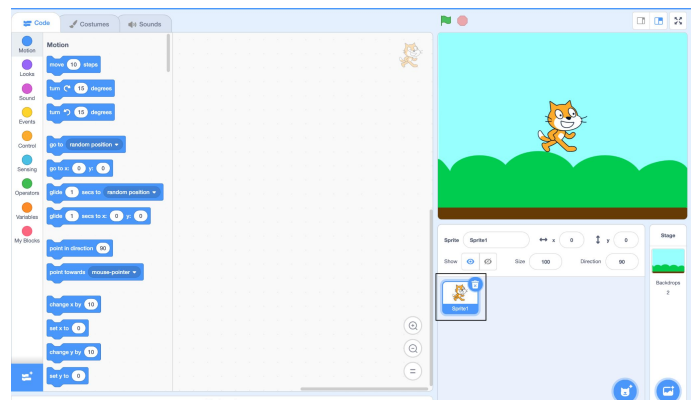
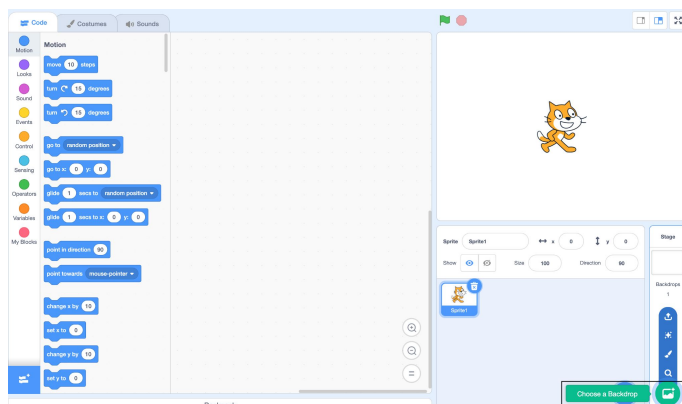
Open a new Scratch project.

**Online:** open a new online Scratch project at [scratch.mit.edu](https://scratch.mit.edu).

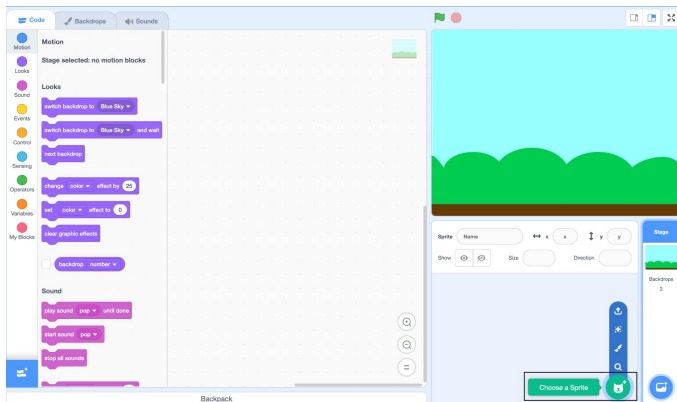
**Offline:** open a new project in the Scratch offline editor. You can download and install Scratch here - <https://scratch.mit.edu/download>

Follow the instructions for each task below.

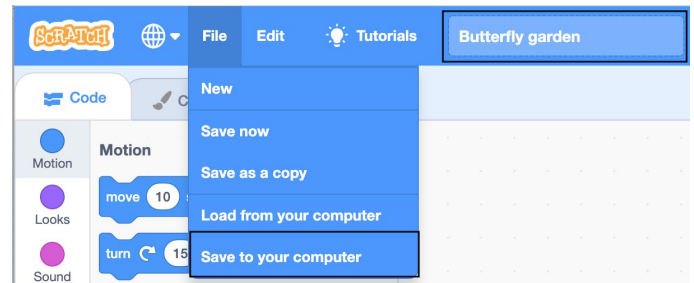
- Click on **Choose a Backdrop**, then select the **Blue Sky** backdrop.
- Delete the cat sprite.



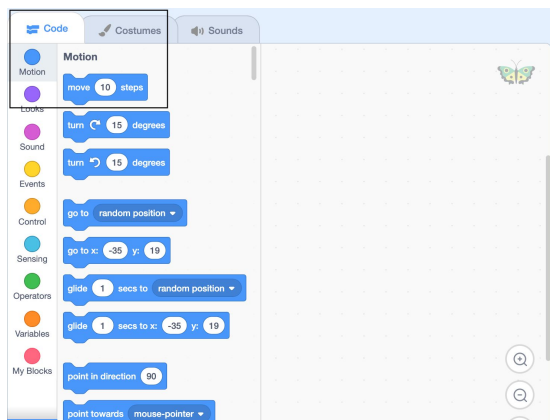
- Click on **Choose a Sprite** and add the **Butterfly 1** sprite to your project.



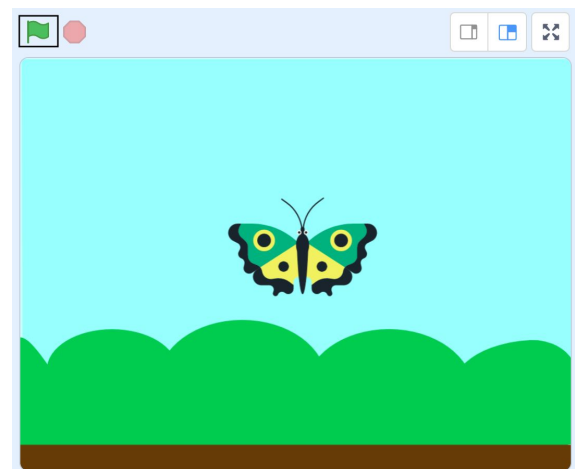
- Now, add your project name and save your project so far. Go to **File** in the menu. If you have a Scratch account, click on **Save now**. If you do not have an account, click on **Save to your computer**.



- Click on the **Code** tab, then select **Motion** to see the **Motion** blocks available. These blocks make sprites move around the Stage.

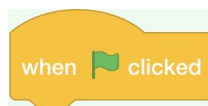


Now, you will make the butterfly move when you click on the green flag above the Stage to start your project.



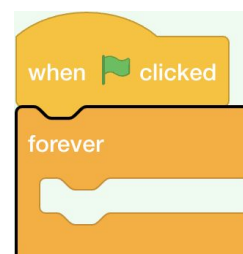
- Click on the **move 10 steps** block a few times and watch your butterfly move across the Stage.

- From the **Events** blocks menu, select a **when green flag clicked** block and drag it into the Code area.



- The code under the **when green flag clicked** block will run when you click on the green flag.

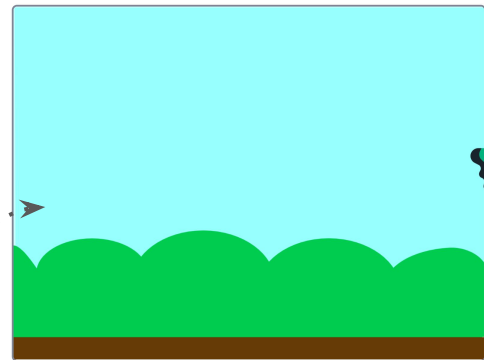
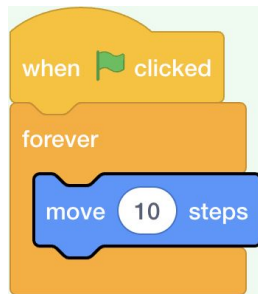
- From the **Control** blocks menu, add a **forever** block and connect it in place under the **when green flag clicked** block.



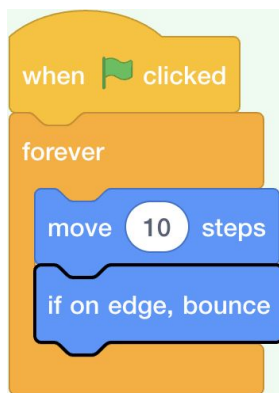
- Code blocks inside a **forever** block will run over and over again.

**Tip:** Notice the subtle colour difference between **Events** (yellow) and **Control** (orange) blocks.

- Now, add a **move 10 steps** block inside the **forever** block. Your butterfly should fly to the right of the Stage and then get stuck.

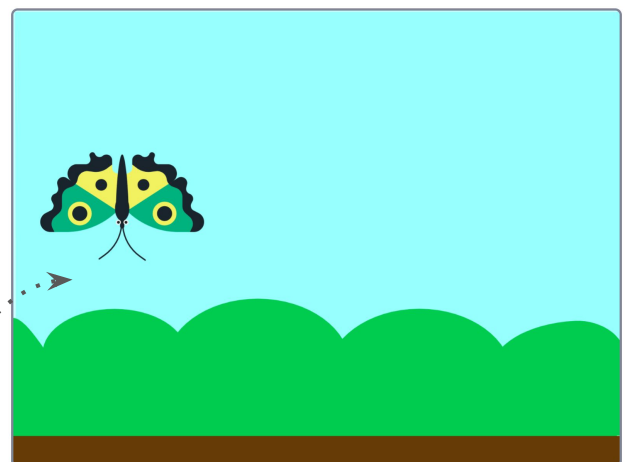


- Click on the green flag to start your project.
- To solve the problem of the stuck butterfly, add an **if on edge, bounce** block. This block makes a sprite change its direction if it bumps into the edge of the Stage.



**Did you spot an issue?** The butterfly goes upside down when it flies to the left.

This is because sprites point in the direction in which they are moving.

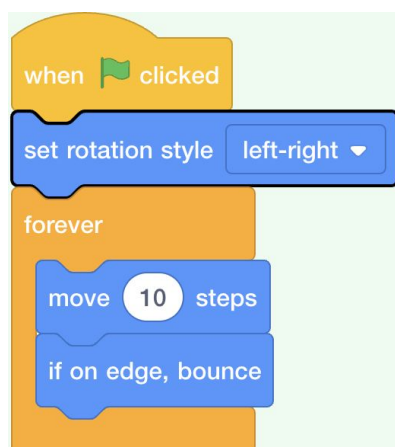


Click on the green flag to restart your project. The butterfly should now fly across the Stage, and it should bounce when it reaches the left and right edges.

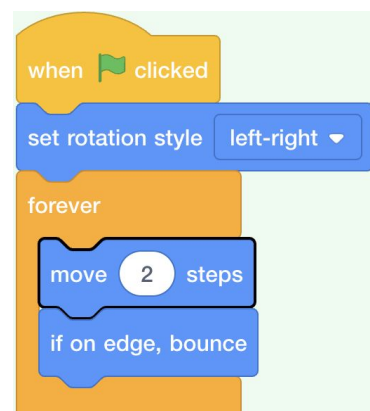
- To fix this, add a **set rotation style left-right** block under the **when green flag clicked** block.

The butterfly garden is supposed to be relaxing, but the butterfly is flying very fast.

- To slow the butterfly down, change the number of steps that it moves at a time from **10** to **2**.



Click on the green flag again. Your butterfly should stay the right way up!



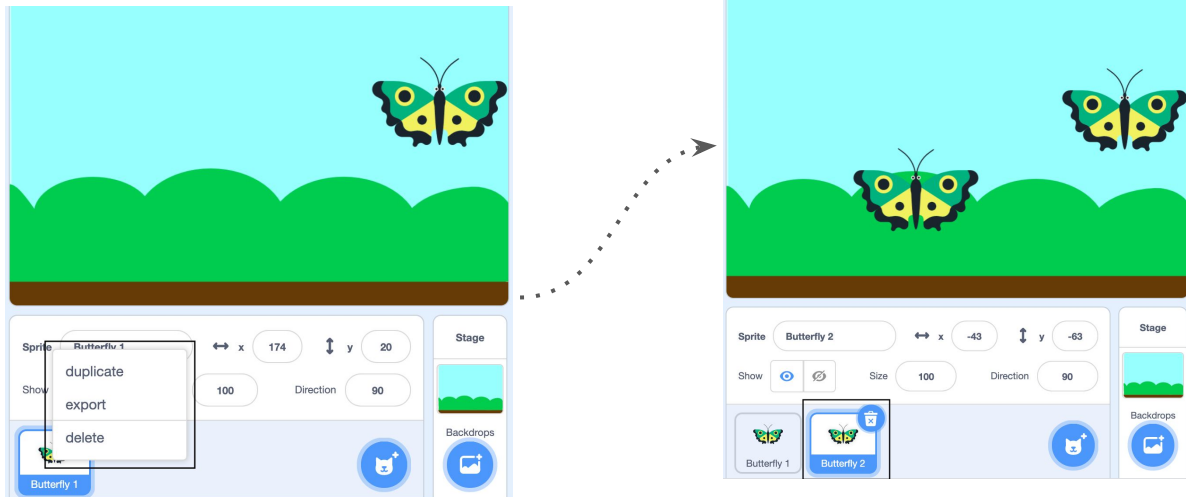
Click on the green flag and watch your butterfly move.

## Section 2 - Fly at an angle

Now, you will add another butterfly, but this time, it will fly at an angle to create a different flight pattern.

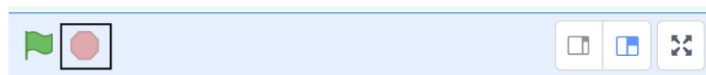
The code for this butterfly will be similar to the code for the **Butterfly 1** sprite. You could add the code again, but it is quicker to **duplicate** (copy) the sprite.

- Right-click on the **Butterfly 1** sprite in the Sprite list below the Stage (or if you are using a tablet, tap and hold) and select **duplicate** in the menu that appears:
- This will create a copy of the **Butterfly 1** sprite called **Butterfly 2**.



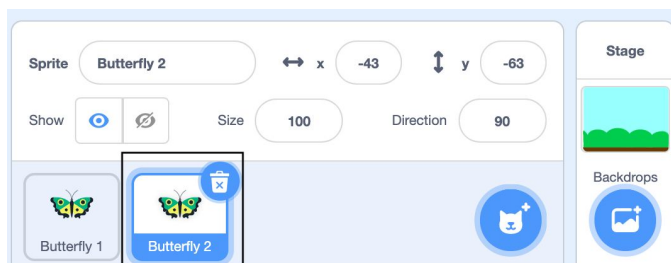
The costumes, code, and settings, such as the size and rotation style, are copied to the new sprite.

- Click on the *green flag* to see both butterflies move.
- Click on the *red stop button* above the Stage to stop the butterflies moving.

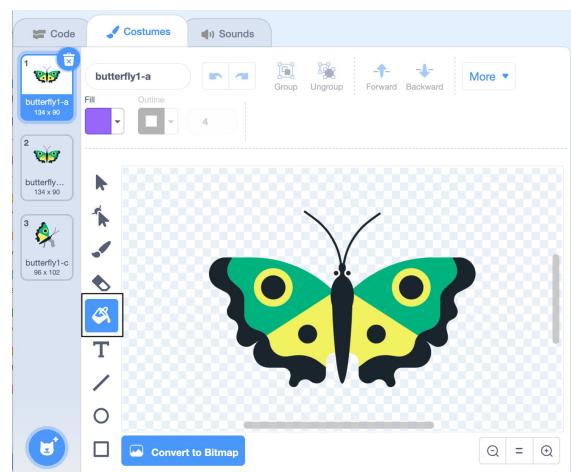
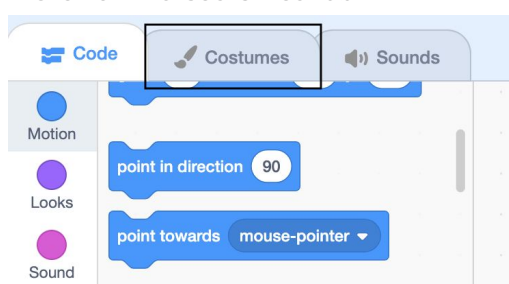


Now, you will change the colour of the **Butterfly 2** sprite so that you can tell them apart easily.

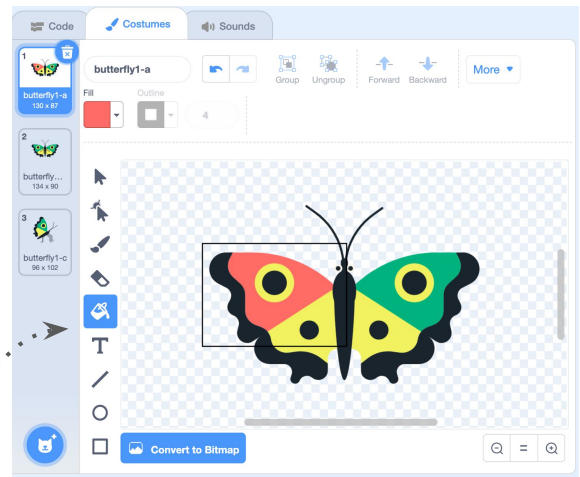
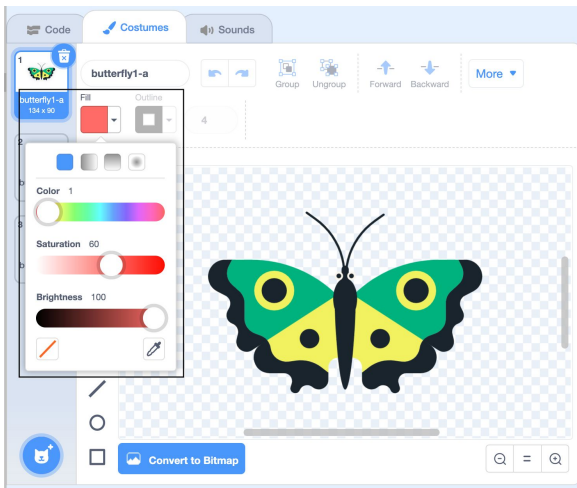
- Click on the **Butterfly 2** sprite in the Sprite list below the Stage.
- Click on the **Fill** (paint bucket) tool.



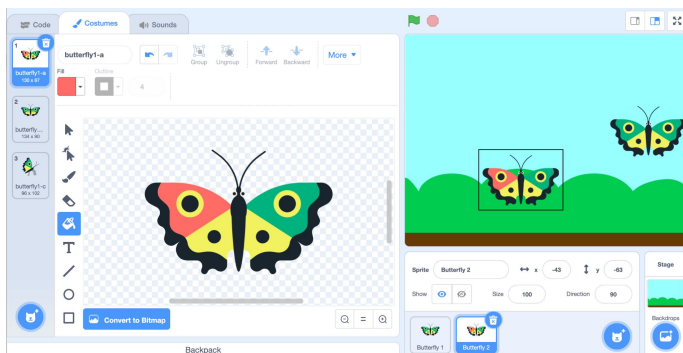
- Click on the **Costumes** tab.



- Click on the **Fill** colour and change the sliders to get a colour that you like.
- Click on the green parts of the butterfly's wing to fill them with your new colour.

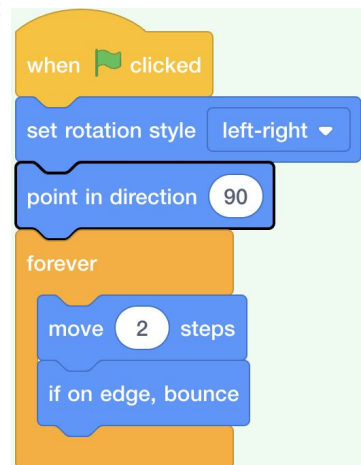


- The colour of the **Butterfly 2** sprite will also change on the Stage and in the Sprite list below the Stage.



Change code for **Butterfly 2** sprite so that it flies in a different pattern.

- Add a **point in direction** block after the **set rotation style left-right** block. A gap will open up and the block will fit into place:

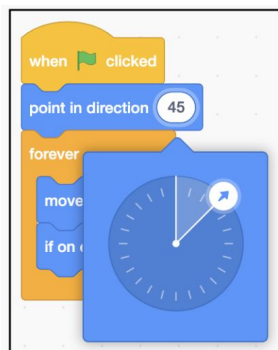


- The **Butterfly 2** sprite also has its own code, same as **Butterfly 1**. Make sure that the **Butterfly 2** sprite is still selected in the Sprite list below the Stage and click on the **Code** tab.

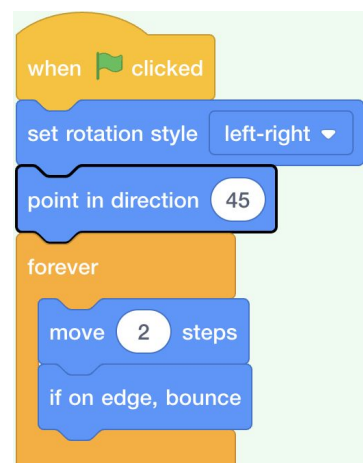
The number **90** in the **point in direction** block means 'point to the right', which is why the butterfly flies to the right at first. **0** means 'point up towards the top of the Stage'.

You will make the **Butterfly 2** sprite fly at a 45-degree angle.

- Click on the number **90** in the **point in direction** block and change the number to **45**. To do this, you can move the arrow that appears, or type **45**.



- Check that your code looks like this:



## Section 3 - Make a small butterfly

Now, you will add a small butterfly that flies at a different angle and flies behind the other butterflies.

- Duplicate the **Butterfly 2** sprite to create a **Butterfly 3** sprite.
- Make the **Butterfly 3** sprite fly in a different direction.

What happens if you choose a negative number?

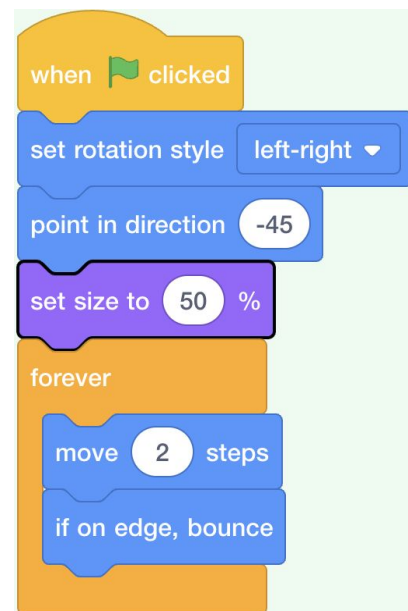


**Tip:** Each sprite has its own costumes and code. Make sure that you select the correct sprite in the Sprite list below the Stage before you click on the **Costumes** or **Code** tabs.

- Change the colour of the **Butterfly 3** sprite's wings so that it looks different to the others. To do this, edit its costume with the **Fill** tool.

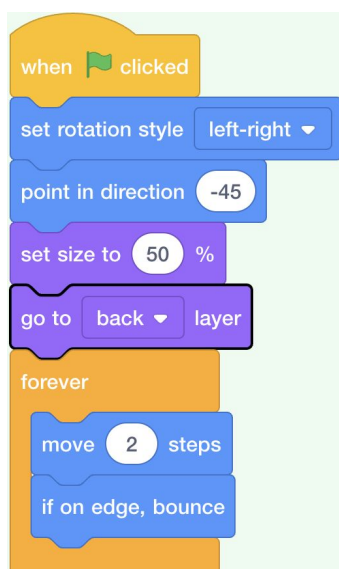
All the butterflies are the same size. The scene will look more realistic if the **Butterfly 3** sprite is smaller and set behind the other butterflies.

- Make the **Butterfly 3** sprite half the size (50%) of the other butterflies. From the **Looks** blocks menu, add a **set size to** block and set the size to **50** (percent):



Now, you need to set the **Butterfly 3** sprite so that it is layered behind the other butterflies.

- Go to the **Looks** blocks menu again. Add a **go to front layer** block and select **back** in the drop-down menu:



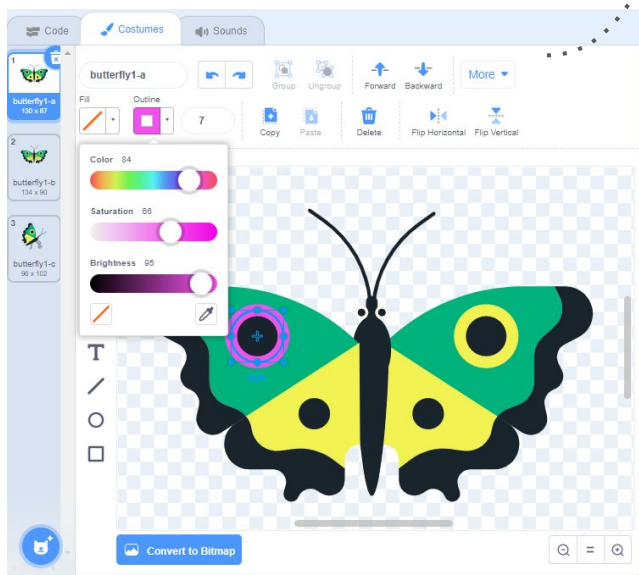
- Click on the green flag to check your program.

Is the **Butterfly 3** sprite smaller than the other butterflies? Also, is it flying behind them?

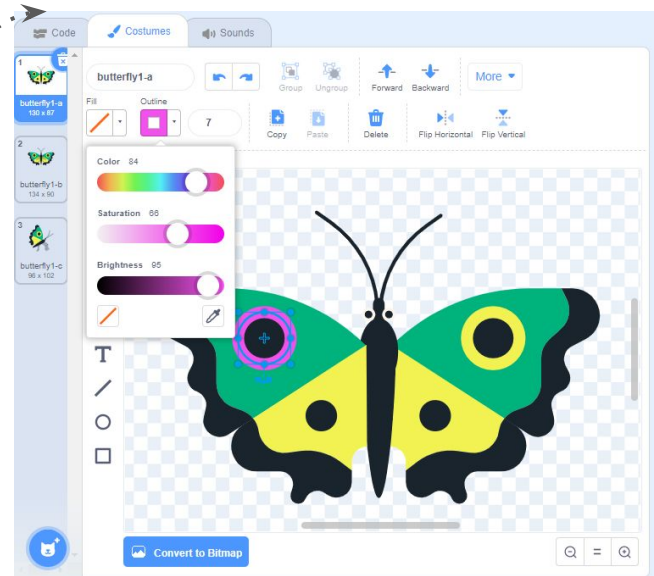




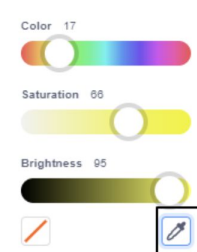
- Get creative and decorate your own butterfly costume with the tools in the Paint editor.
- The circles are outlines of a circle shape, so you can't use the **Fill** tool.
  - First, click on a wing.
  - Then, click on **Ungroup** to separate the objects.



- Click on the circle that you separated on the wing.
- Now, you can change the **Outline** colour for the circle.



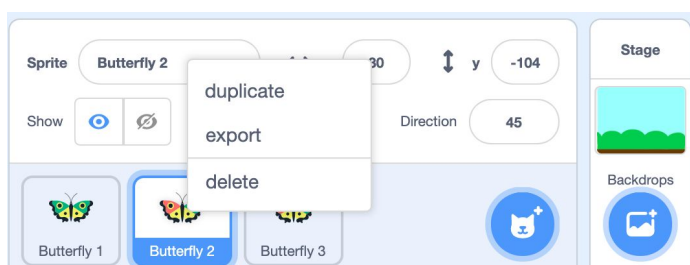
- Repeat these steps for the other wing. You can use the **Colour picker** tool to choose the same colour as you used for the other wing.



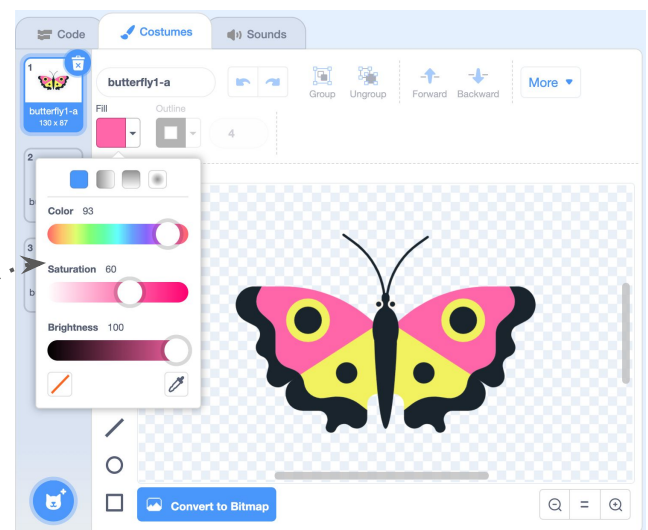
## Section 4 - Round on round

In computing, a clear set of instructions is called an algorithm. The next butterfly is going to use a different **algorithm** to make it fly in a circle.

- Duplicate the **Butterfly 2** sprite to create a new sprite. This will automatically be called **Butterfly 4**.



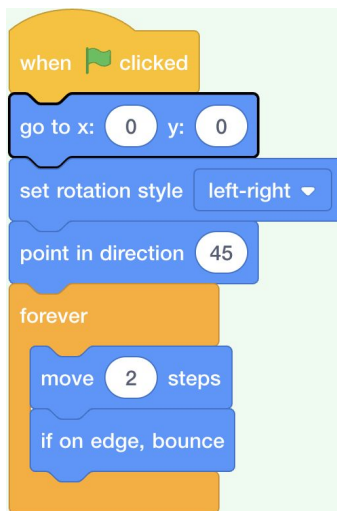
- Change the colour of the **Butterfly 4** sprite so that you can identify it easily.



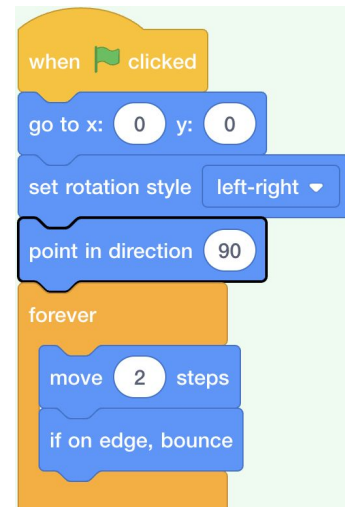
- Add a **go to x: y:** block after the **when green flag clicked** block. The numbers in the block will be the current coordinates of the butterfly on the Stage.

The centre of the Stage is at coordinates **x: 0 y: 0**.

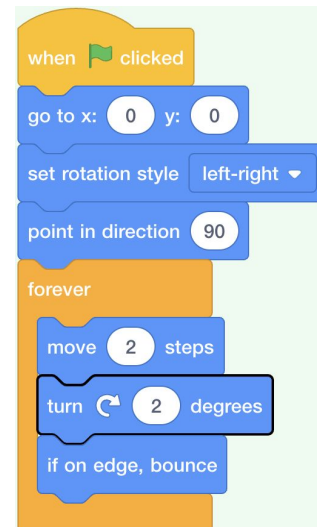
- Change the numbers in the **go to x: y:** block so that your butterfly starts its flight in the centre of the Stage:



- Change the direction to **90** (degrees) so that the butterfly points to the right at the start of the program:



Now, add a **turn right** (clockwise) block and change the number of degrees to **2** so that the butterfly changes direction by a small amount each time it moves:



Click on the green flag and watch your butterfly fly in a circle.

## Section 5 - Add more

Now it's time to get creative with your butterfly garden.

- Duplicate the **Butterfly 4** sprite (the butterfly that flies around in circles) and change the amount that it moves and turns by. What happens?
- Change the size of some of the butterflies so that some of them appear far away.



Save your project



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