Raspberry Pi Projects

Flower generator

Introduction

In this project you will create a `draw flower` block which can create flowers of different sizes, shapes, and numbers of petals. You'll use your new block to create flower designs and patterns. You can also adapt the project to create other interesting geometric patterns.

You can export the pictures you have created on the stage, and use them as wallpapers on your phone or desktop computer, or as backdrops in other Scratch projects.

What you will make

In this example project, you can press `f` to draw some flowers, or `r` to draw lots of flowers in random positions, or `p` to draw a flower pattern. All of these options use the same `draw flower` block with different inputs.

What you will learn

This project covers elements from the following strands of the Raspberry Pi Digital Making Curriculum (http://rpf.io/curriculum):

- Apply basic programming constructs to solve a problem (https://curriculum.raspberrypi.org/programming/builder/)

What you will need

Hardware

- An computer with internet connection

Software

- Scratch 2.0 (online or offline)

Generate a flower

First you're going to generate a flower which can be drawn on the screen.

- Create a new Scratch project.

Creating a new Scratch project

You can use Scratch online or offline.

- To create a new Scratch project using the online editor, go to jumpto.cc/scratch-new (http://jumpto.cc/scratch-new).
- If you prefer to work offline and have not installed the editor yet, you can download it from jumpto.cc/scratch-off (http://jumpto.cc/scratch-off).

  The Scratch editor looks like this:

- The cat sprite that you can see is the Scratch mascot. If you need an empty Scratch project, you can delete the cat by right-clicking it and then clicking **delete**.

Now you will use the Paint tool to create a new sprite shaped like a flower petal, and name it ‘Flower’.

- In the Paint tool, switch to **Vector mode** and use the Ellipse tool to draw a petal shape filled in orange (you’ll use code to add more colour later).

  Note: Shapes created using Vector mode look neater when you change their size.

- Add code to your Flower sprite to stamp a flower with six equally rotated petals when you click the green flag.

I need a hint

You’ll need to repeat the code to **stamp** and **turn** the petal six times.
There are 360 degrees in a circle. Divide 360 by 6 to work out by how many degrees each petal needs to be rotated.

You can click **Clear** to clear the stage.

Try using these blocks:

Here’s the code:

You may find that your petals are offset in an odd way:

This is because the sprite is being rotated around its centre.

- Change where the centre of your petal shape is using the crosshair tool:

The centre should be at the bottom centre of the petal.

- Clear the stage and run your code again to check that the petals are straight.

Make a custom block to draw flowers

+What if you want to draw lots of flowers? Instead of repeating the code, you can create your own block in Scratch and use it every time you want to draw a flower.

- Make a new block and name it `draw flower`:

- You will see a new block called `draw flower` and a new definition block on the stage:

- Move your code for drawing the flower from the `when green flag clicked` block to the new `draw flower` definition block.

  Your code should look like this:

- Clear the stage and click the green flag. Nothing will happen. That's because you have defined what the `draw flower` block should do, but not said when to do it.

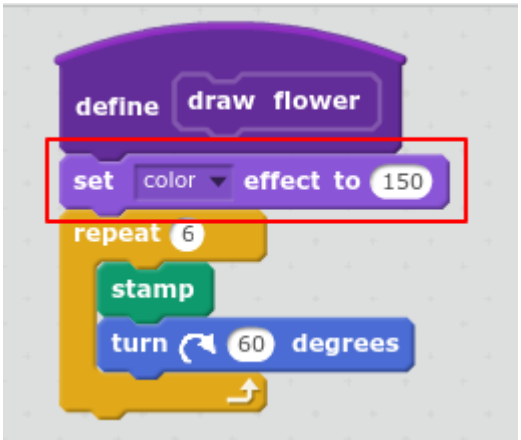
- Add the following code to clear the stage and draw a flower when the green flag is clicked:

- Test your code and make sure you see a flower.
- Now change your code to move and draw another flower:
- Test your code to check whether you now see two flowers.

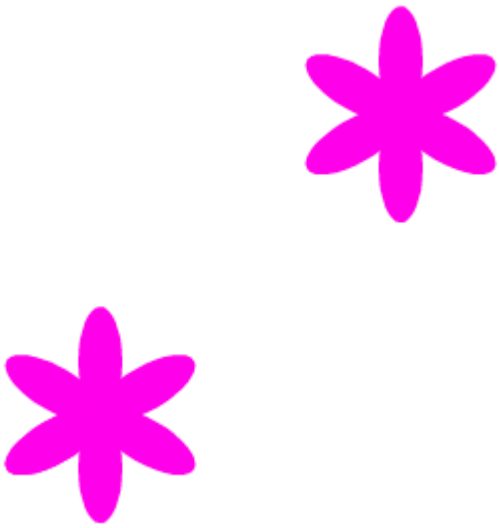
Customise your flowers

At the moment all the flowers you draw are exactly the same. Let's add some inputs to the `draw flower` block so that flowers can be different colours and sizes, and can have different numbers of petals.

- In Scratch you can use the `set colour effect` block to change the colour of a sprite. Change your 'draw flower' definition to change the colour:



- Run your code to see flowers of different colours:

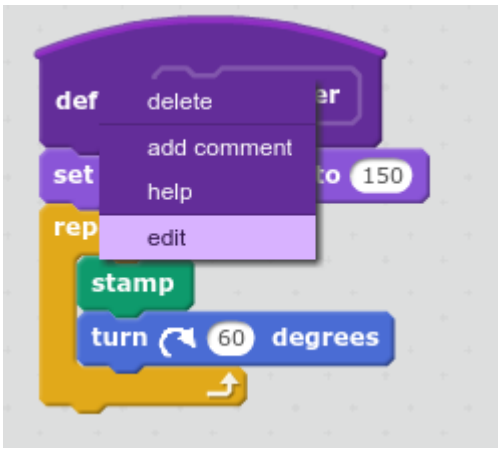


`set colour effect` changes the colour based on the default colour of the sprite, so if you didn't use orange, you'll get different results.

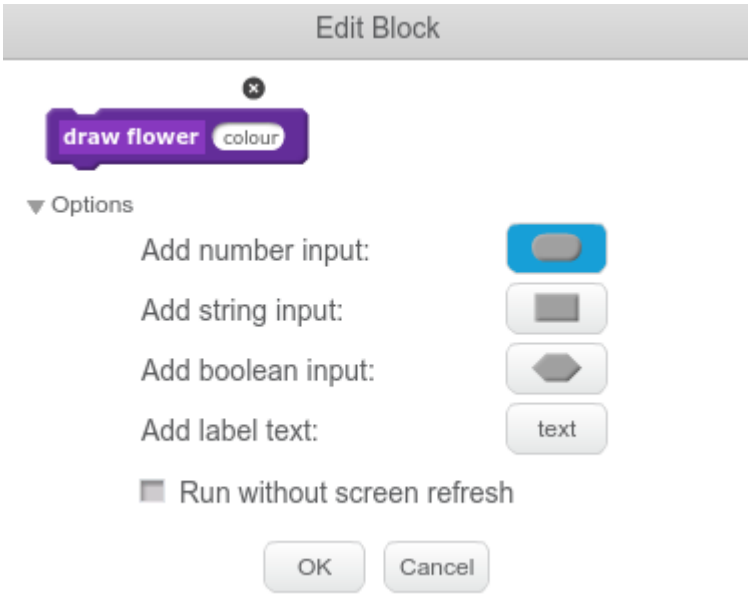
- Experiment with using different numbers from 0 to 199 in the `set colour effect` block.

At the moment all flowers will be the same colour. We can add an **input** to the `draw flower` block to choose a different colour each time we use it.

- Right-click on the `draw flower` definition block and choose **edit**:

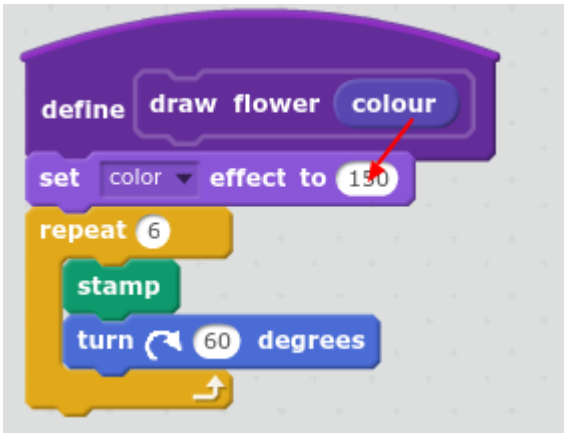


- Now add a **number input** called 'colour':

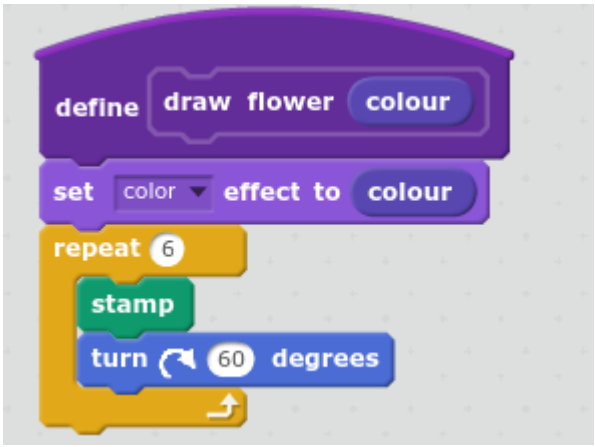


The input will appear in the `draw flower` definition, and you can drag it to where you want to use it.

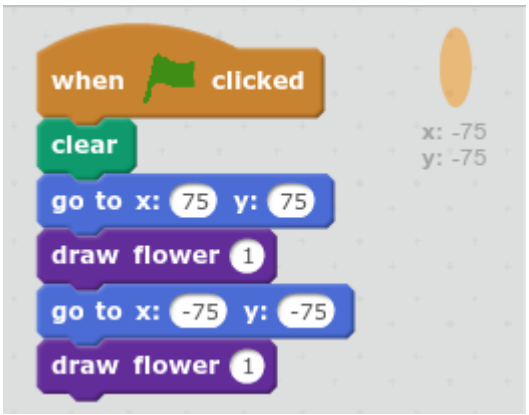
- Drag the 'colour' input to the `set colour effect` block:



- Your code should look like this:

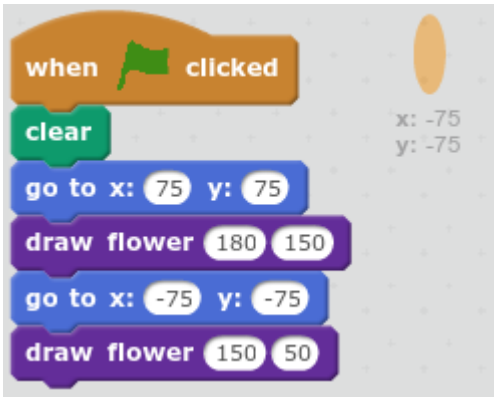


- Notice that your `draw flower` blocks now have a new input:

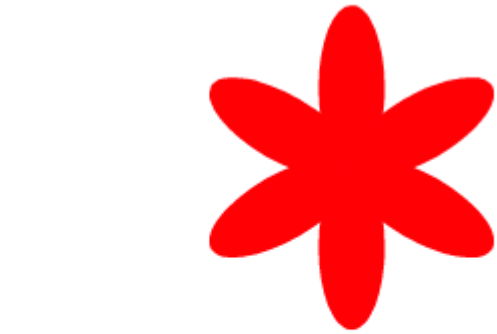


- Change the numbers in `draw flower` so that the flowers which appear are different colours. Pick any numbers between 0 and 200.

- Now add another input to set the size of the flower so that you can write code like this…



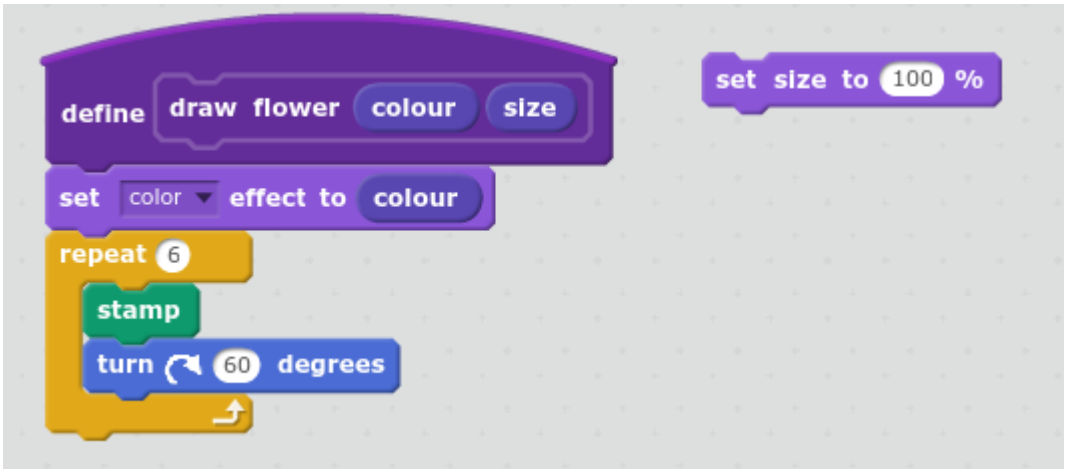
…o create flowers of different sizes:



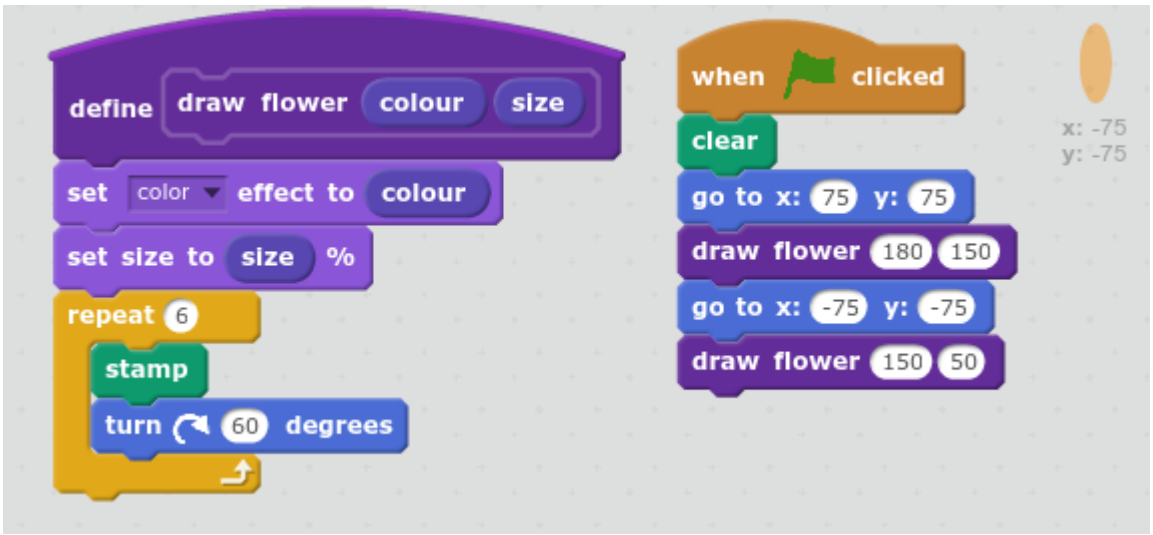
I need a hint

Look at what you did to add the ‘colour’ input, and repeat it to add a ‘size’ input which you can use to set the size of the sprite.

You’ll need to use the following block with the ‘size’ input in your `draw flower` definition.



Your code should look like this:



- How about changing the number of petals? Add another input so that you can choose the number of petals each flower has so that you can draw flowers like this:

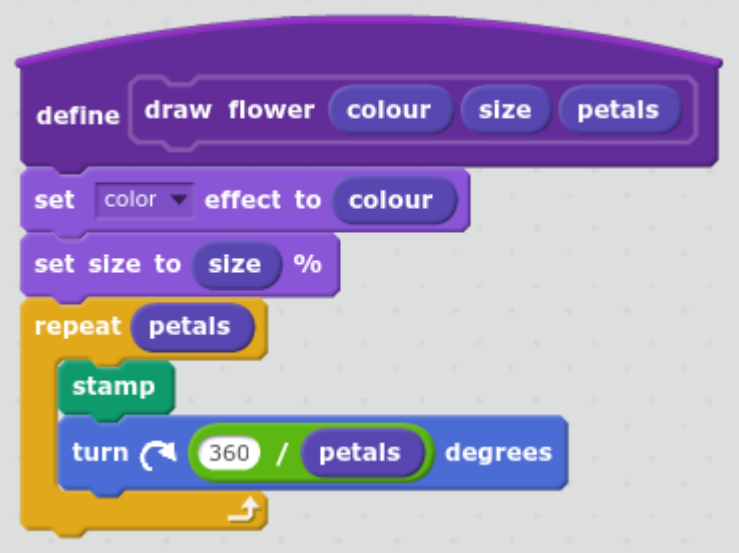
I need a hint

You'll need to add a 'petals' number input, and then use it in the definition of the `draw flower` block.

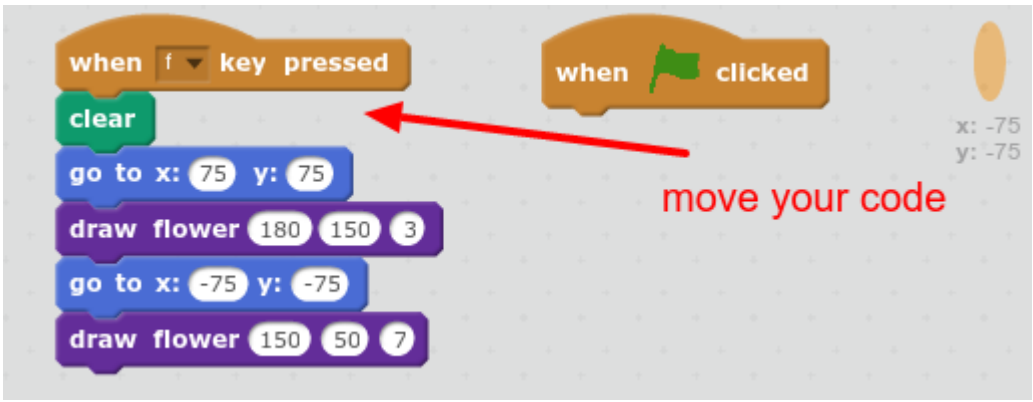
There are two places where you'll need to use the 'petals' input. The number of degrees you need to rotate the Flower sprite will be 360 divided by the number of petals.

You'll need to use the following block to work out how many degrees to turn:

Your code should look like this:



- Now move your flower drawing code under a `when f key pressed` block so you'll be able to draw different flowers when you press different keys.



- Press `f` to test your code.

Challenge: Create a flower design

Can you use your `draw flower` block several times to draw more flowers and create an interesting design? Drawing different flowers at the same location creates an interesting effect.

- Create a design that you like. Here's an example:

Need a reminder on how coordinates work in Scratch?

Scratch coordinates

Scratch coordinates

- In Scratch, the coordinates `x:0, y:0` mark the central position on the Stage.

  A position like `x:-200, y:-100` is towards the bottom left on the Stage, and a position like `x:200, y:100` is near the top right.

- You can see this for yourself by adding the **xy-grid** backdrop to your project.

- To find out coordinates of a specific position, move your mouse pointer to it and check the readings below the bottom right corner of the Stage.

You don't have to use petals shaped like ellipses. This 'firework' pattern was created using a thick straight line and a black backdrop:

The 'petal' is just a line with the crosshair a bit below the bottom:

- Experiment with adding new petal costumes and see what you can come up with.

- What happens if you try out a shape which is not filled in, such as a square?

Saving the stage

If you've created a pattern you like, you can save it and use it in another Scratch project, or as a screensaver or on a web site.

- When you have a pattern on the stage that you like, you can right-click and choose **save picture of stage** (on some computers you may need to hold down the `Shift` key when you right-click).

  This allows you to save a PNG image of the stage.

- Choose a sensible file name and location to save.

Challenge: random flower generator

What do you think this code will do?

- Try changing the code above to create your own random flower generator. You can use random ranges for colour, size, and number of petals.

Challenge: flower patterns

You can also use your `draw flower` block to create neat flower patterns.

- Create a flower or a combination of flowers that you like. Here's an example:

- Press `p` to see your flower. The example looks like this:

- Right-click on the Flower sprite and `hide` it so it doesn't appear on the stage. (You can show the sprite again if you need to see where it is.)

- Now draw a row of these flowers across the top of the stage. Here's an example, but you might need to adjust the numbers to work with your flower:

- Press `p` to see a row of flowers:

- Add another loop to create more rows of flowers. This example adds a `repeat 3` loop to create three rows.

- Press `p` to see a grid of flowers:

- Do you want to speed up the drawing of the flowers? Right-click on the `draw flower` definition block and choose **edit**. Tick the **Run without screen refresh** box.

Now the flowers will be drawn more quickly.

- You can also change the colour of the stage. Click on **Paint new backdrop**. Create an orange backdrop by using the Fill tool in Bitmap mode.

  Using orange means that the numbers for different colours will match the ones for the petal.

- Now you can use the `set colour effect` on the stage to change the colour of the backdrop.

- Try different things to create a pattern you like.

  Here's an example:

Challenge: custom flower blocks with inputs

These flowers all have the same number of outer and inner petals, and the size of the inner flower is in proportion to the outer flower:

We can create a `draw double flower` custom block with inputs for `outer colour`, `inner colour`, and `size`.

We can then use the `draw double flower` block to draw lots of flowers in the same style:

See how `draw double flower` is defined

We work out the size of the inner flower from the **`size`** input so that it is always in proportion.

Can you create a new custom block for a kind of flower that you like, and add the inputs that you want to be able to change it?

Then create a design that you like using your new block.

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