Projects

Paint box

Make your own paint program

Scratch

Step 1 Introduction

Make your own paint program!

What you will make

You will click on the green flag to start, and you'll use the mouse to move the pencil and hold down the left mouse button to draw. Clicking on a colour will change pencil colours, and clicking on the eraser will change to the eraser!

What you will learn

- Add the pen extension in Scratch

- Use broadcasts to control a sprite in Scratch
- Recall how to respond to mouse events in Scratch

What you will need

Hardware

- A computer capable of running Scratch 3

Software

- Scratch 3 (either **online** (http://rpf.io/scratchon) or **offline** (http://rpf.io/scratchoff))

Downloads

- **Offline starter project** (http://rpf.io/p/en/paint-box-go)

Additional information for educators

If you need to print this project, please use the **printer-friendly version** (https://projects.raspberrypi.org/en/projects/paint-box/print).

You can find the **completed project here** (http://rpf.io/p/en/paint-box-get).

Step 2 Make a pencil

Start by making a pencil that you can use to draw on the Stage.

Open the 'Paint box' Scratch starter project.

Online: open the starter project at **rpf.io/paint-box-on**

(http://rpf.io/paint-box-on)

If you have a Scratch account you can make a copy by clicking **Remix**.

Offline: open the **starter project** (http://rpf.io/p/en/paint-box-go) in the offline editor.

If you need to download and install the Scratch offline editor, you can find it at **rpf.io/scratchoff** (http://rpf.io/scratchoff)

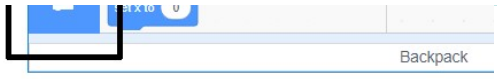
In the starter project, you should see pencil and eraser sprites:

Add the Pen extension to your project.

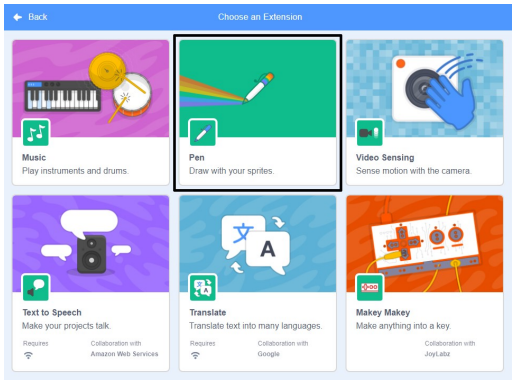
How to add the Pen extension

To use the Pen blocks in Scratch, you need add the **Pen extension**.

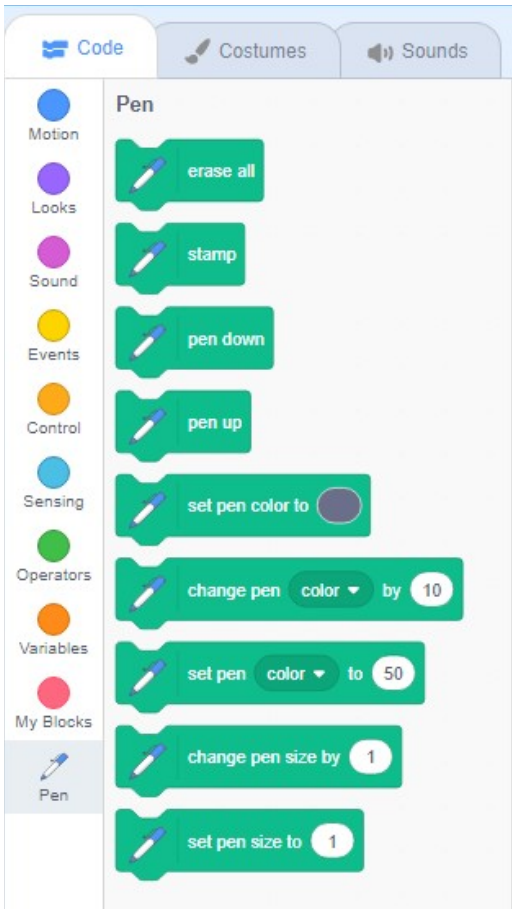
- Click on the **Add extension** button in the bottom left-hand corner.



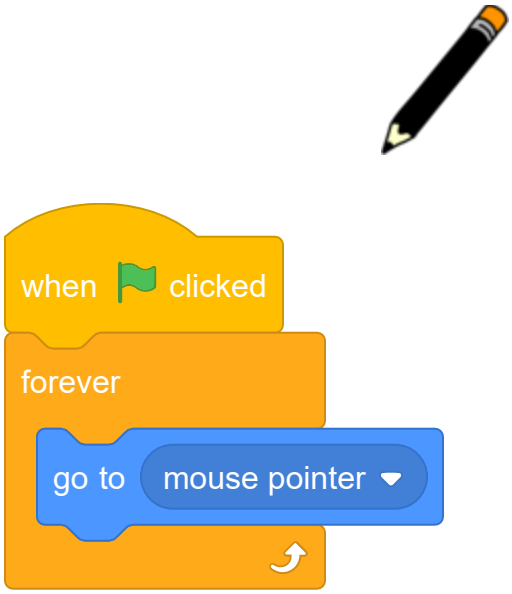
- Click on the **Pen** extension to add it.



- The Pen section then appears at the bottom of the blocks menu.



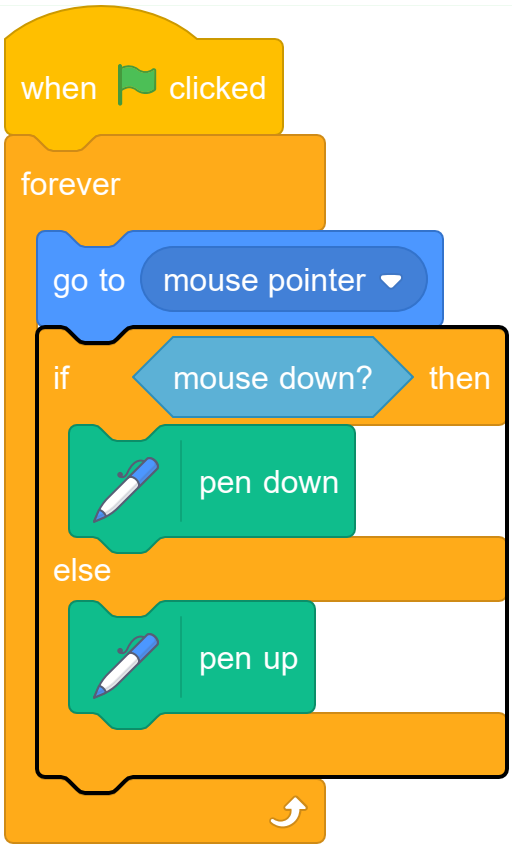
Add some code to the pencil sprite to make the sprite follow the mouse pointer `forever` so that you can draw:



Click the flag and then move the mouse pointer around the Stage to test whether your code works.

Next, make your pencil only draw `if` the mouse button is being clicked.

Add this code to your pencil sprite:



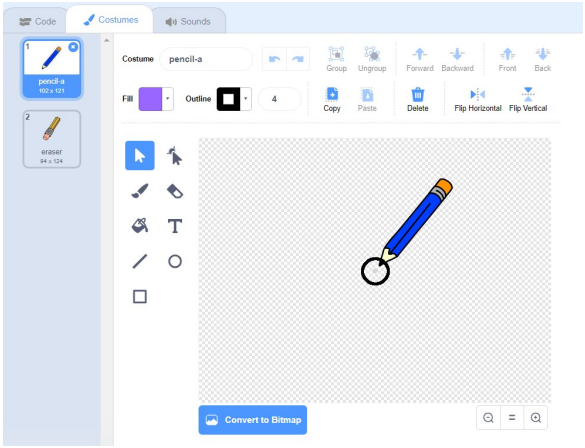
Test your code again. This time, move the pencil around the Stage and hold down the mouse button. Can you draw with your pencil?

Does your pencil not draw from its tip?

If the line your pencil draw looks like it is coming from the pencil's middle, you need to change your pencil sprite's so the tip is the sprite's centre.

Click on the pencil sprite, and then click on the **Costumes** tab.

Move the costume's so the tip of the pencil is **just above** the centre.

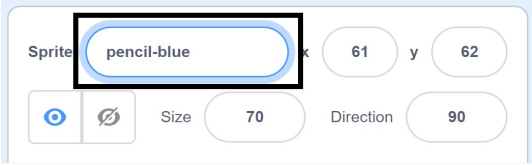


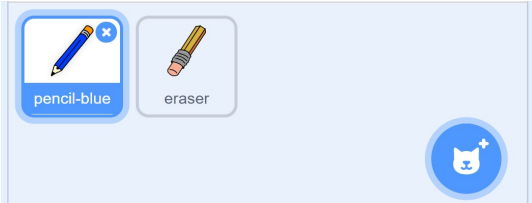
Now move the pencil around on the Stage and draw. The pencil should now draw a line from its tip.

Step 3 Coloured pencils

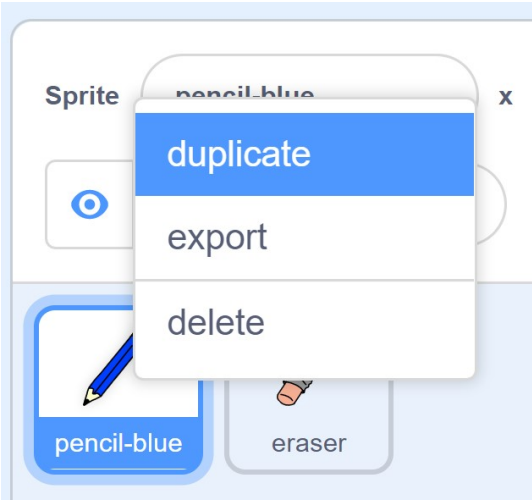
Now you're going to add different coloured pencils to your project and allow the user to choose between them.

Rename the `pencil` sprite to `pencil-blue`

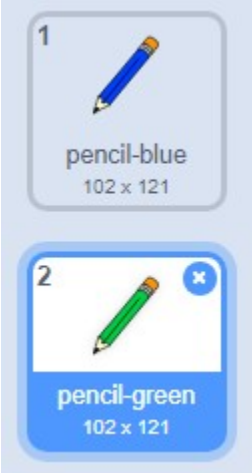




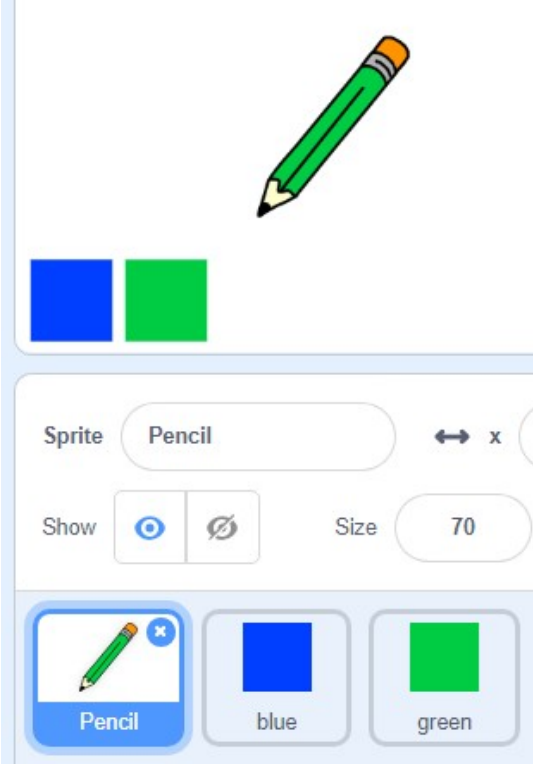
Right click on the pencil sprite, and duplicate the ‘pencil-blue’ costume.



Name the new costume ‘pencil-green’, and colour the pencil green.



Draw two new sprites: one blue square and one green square. These are for choosing between the blue and green pencil.



Rename the new sprites so that they are called ‘blue’ and ‘green’

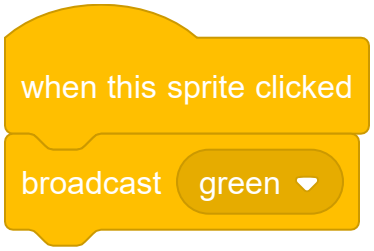
Rename a sprite in Scratch

To rename a sprite in Scratch, click on the sprite:

The information about the sprite will be displayed above:

Edit the name of the sprite.

Add some code to the 'green' sprite so that when this sprite is clicked, it `broadcasts` the message "green".



Broadcast a message in Scratch

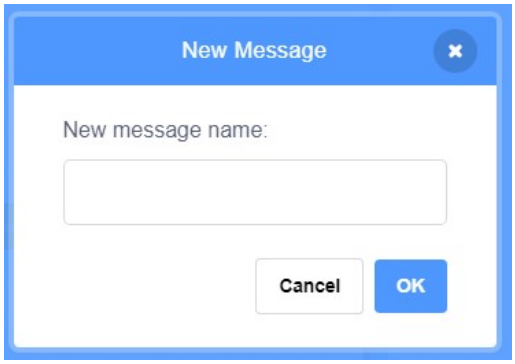
A broadcast is a way of sending a message from a sprite which can be heard by all sprites. Think of it like an announcement made over a loudspeaker.

Send a broadcast

You can send a broadcast by creating a broadcast block and giving it a name:

- Find the **broadcast** block under **Events**
- Select **New Message** in the drop-down menu.

- Then type your message

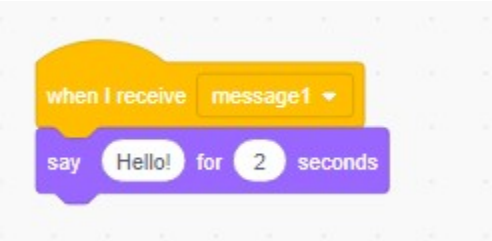


The message text can be anything you like, but it is useful to give the broadcast a sensible description. What happens when the message is received depends on the code you write.

Receive a broadcast

A sprite can react to a broadcast by using this block:

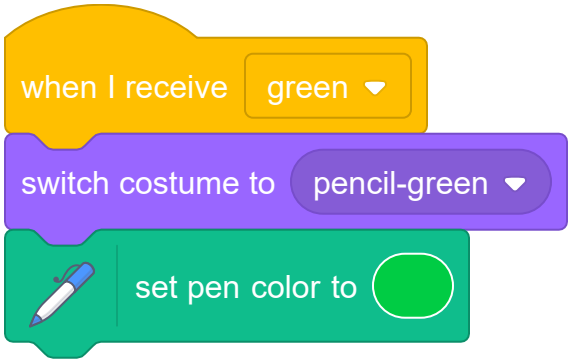
You can add blocks below this block to tell the sprite what to do when it receives the broadcast signal.



The pencil sprite should listen for the “green” message and change

its costume and pencil colour in response.

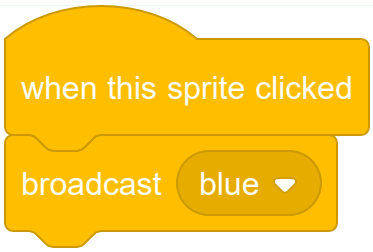
Switch to your pencil sprite. Add some code so that when this sprite receives the `green` broadcast, it switchs to the green pencil costume and changes the pen colour to green.



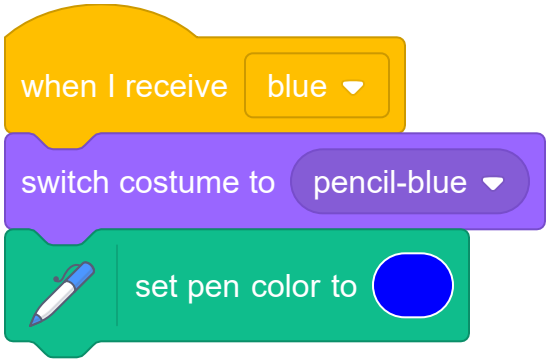
To set the pencil to colour to green, click the coloured square in the `set pen color` block, and then click on the green square sprite.

Then to a similar thing so that you can switch the pencil colour to blue.

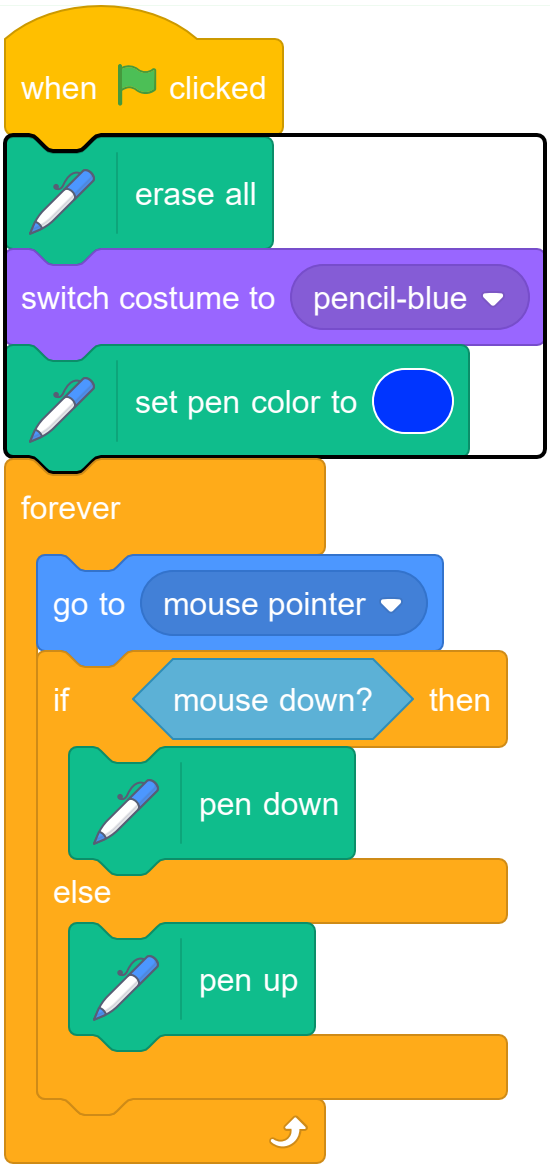
Click on the blue square sprite and add this code:



Then click on the pencil sprite and add this code:

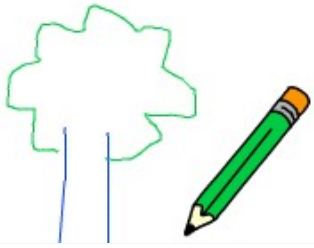


Finally, add this code to tell the pencil sprite which colour to start with, and to make sure that the screen is clear when your program starts.



If you prefer, you can start with a different colour pencil.

Test your code. Can you switch between the blue and green pencil colours by clicking on the blue or green square sprites?

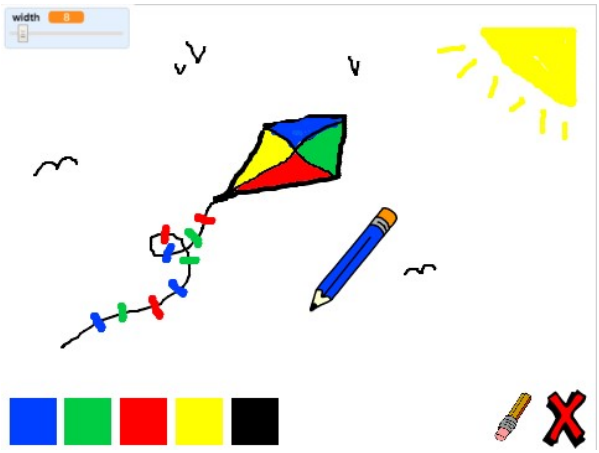


Challenge!

Challenge: more pencils

Can you add red, yellow, and black pencils to your paint program? Take a look at the earlier steps if you want a reminder of how to do this.

Can you use your pencils to draw a picture?



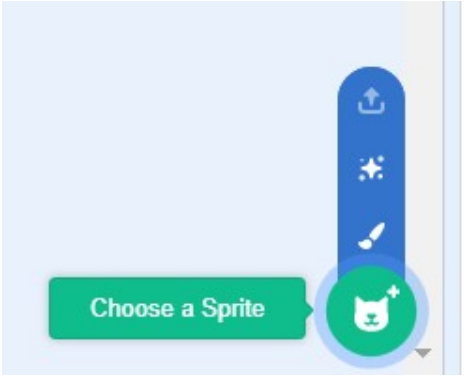
Step 4 Undo mistakes

Sometimes mistakes happen, so add a ‘clear’ button and an eraser button.

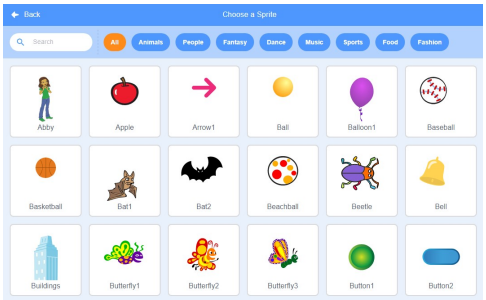
Add the ‘X-block’ sprite from the library’s letters section. Colour the sprite’s costume in red and make it a little smaller. This sprite is the ‘clear’ button.

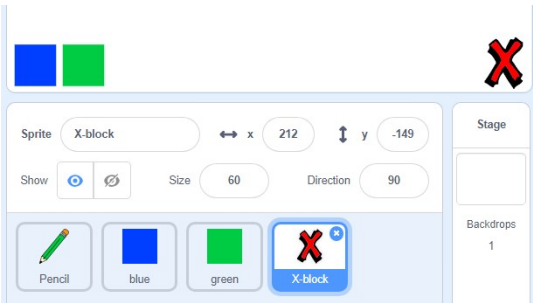
Adding a Scratch sprite from the Library

- Click **Choose a sprite** to see the library of all Scratch sprites.



- You can search or browse sprites by theme. Click on a sprite to add it to your project.

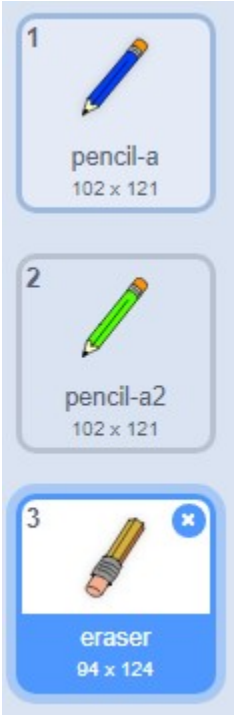




Add code to the 'X-block' sprite to clear the Stage when the sprite clicked.

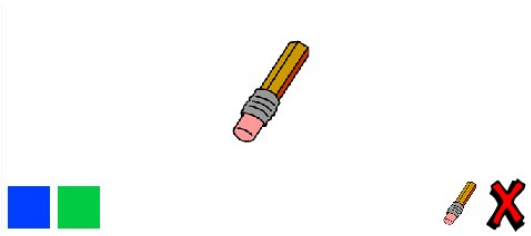
You don't need to use a `broadcast` to clear the Stage, because the `erase all` block does that job.

Do you see that the pencil sprite includes an eraser costume?

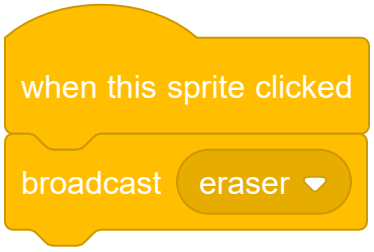


Your project also includes a separate eraser sprite.

Right-click on this eraser sprite and then click on **show**. Here is how your Stage should look now:



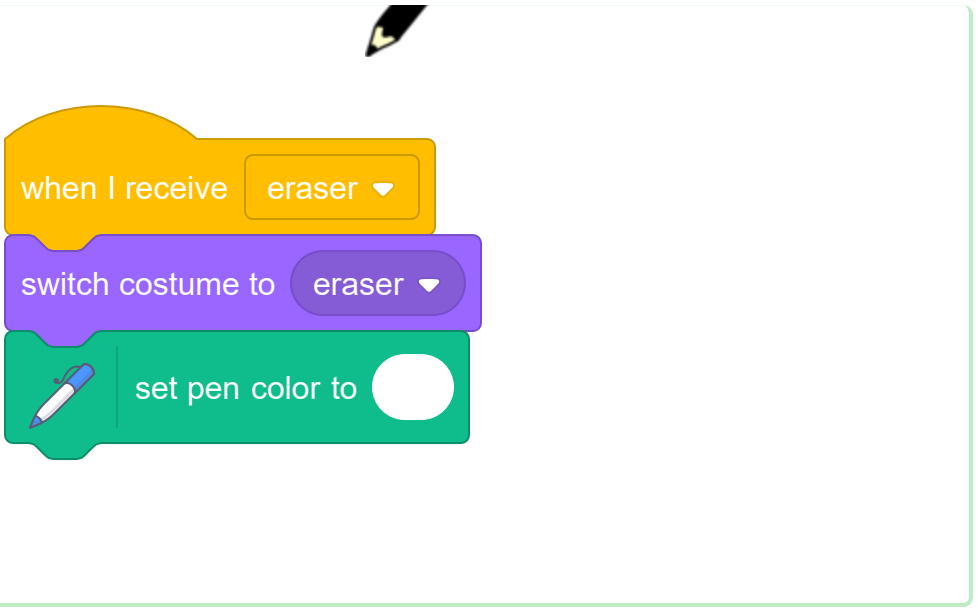
Add code to the eraser sprite to send an `'eraser'` `broadcast` when the eraser sprite is clicked.



When the pencil sprite receives the ‘eraser’ message, it should switch its costume to the eraser and switch the pen colour to white, which is the same colour as the Stage!

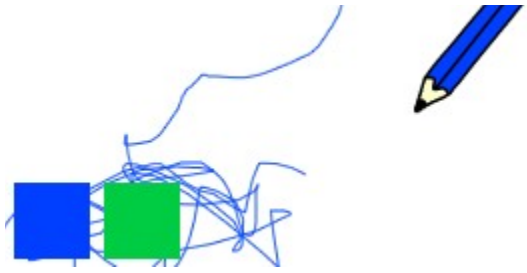
Add some code to create the eraser.

Here is what the code should look like:

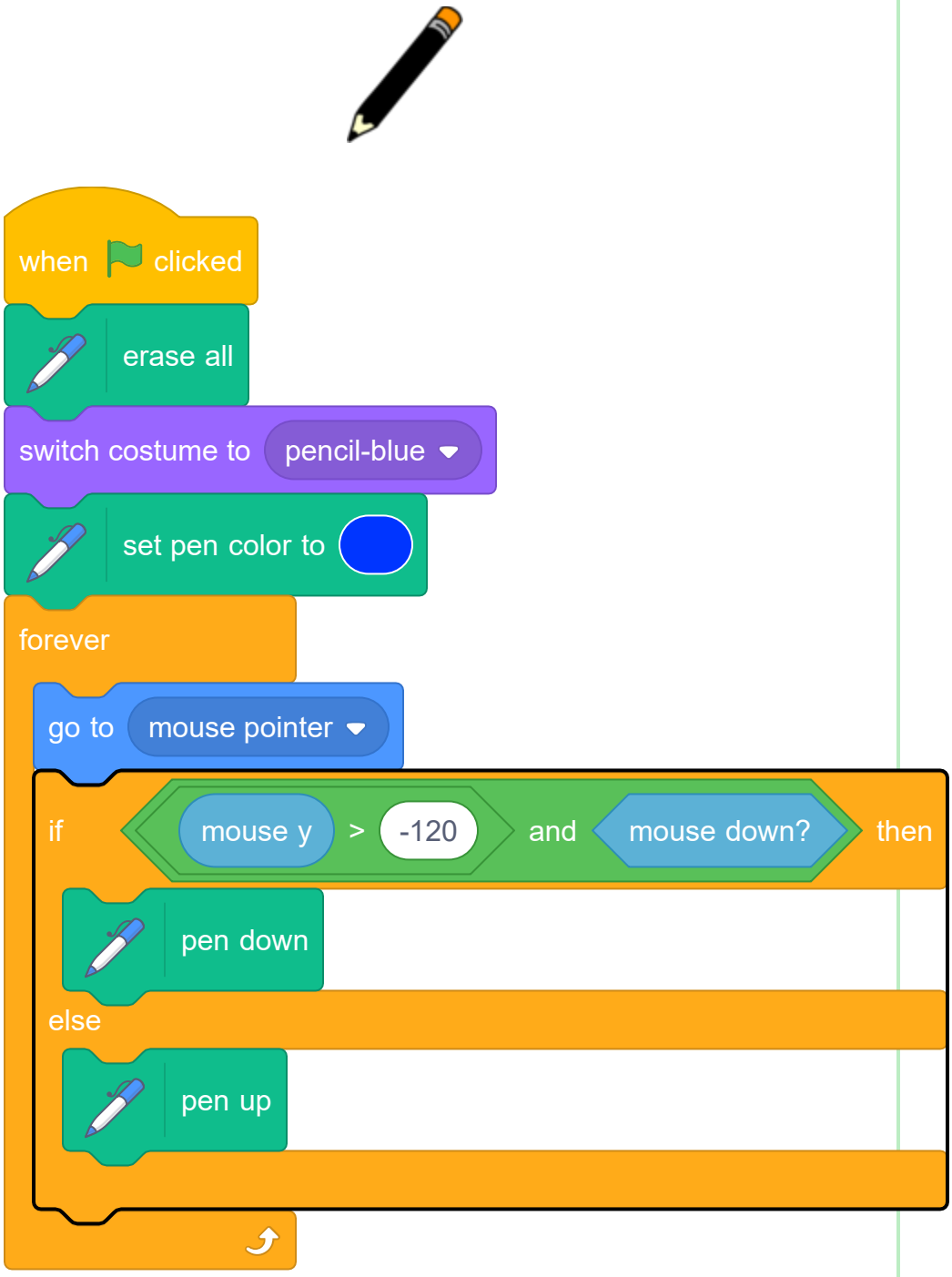


Test your project to see if you can clear the Stage and erase pencil lines.

There's one more problem with the pencil: you can draw anywhere on the Stage, including near the 'clear' and eraser buttons!



To fix this, change the code so that the pen is only down if the mouse is clicked **and** the y position of the mouse pointer is greater than -120:



Test your project. You now should not be able to draw near

the buttons.

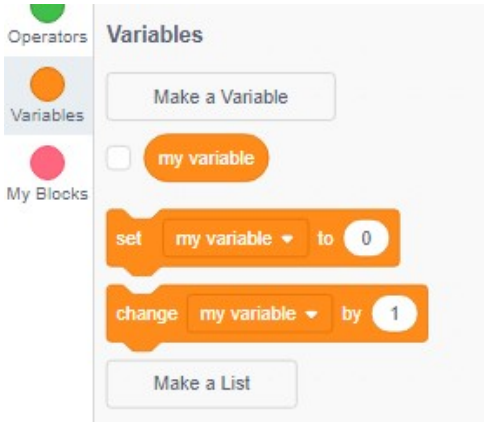
Step 5 Change the pen width

Next you will add code to allow the person using your program to draw things with different pen widths.

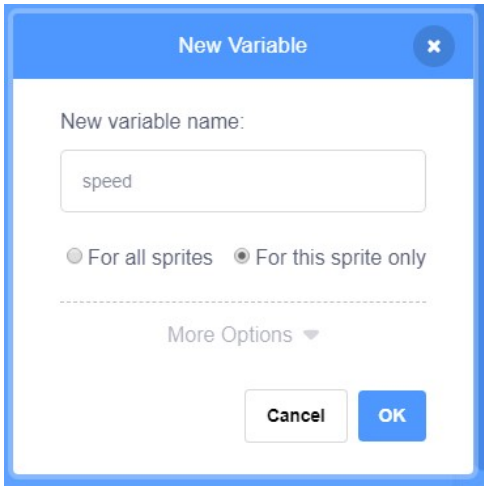
First, add a new variable called `width`.

Add a variable in Scratch

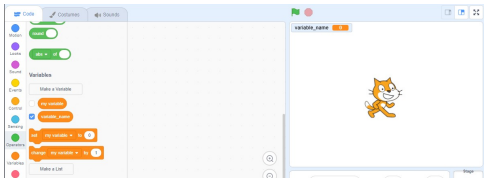
- Click on **Variables** in the Code tab, then click on **Make a Variable**.



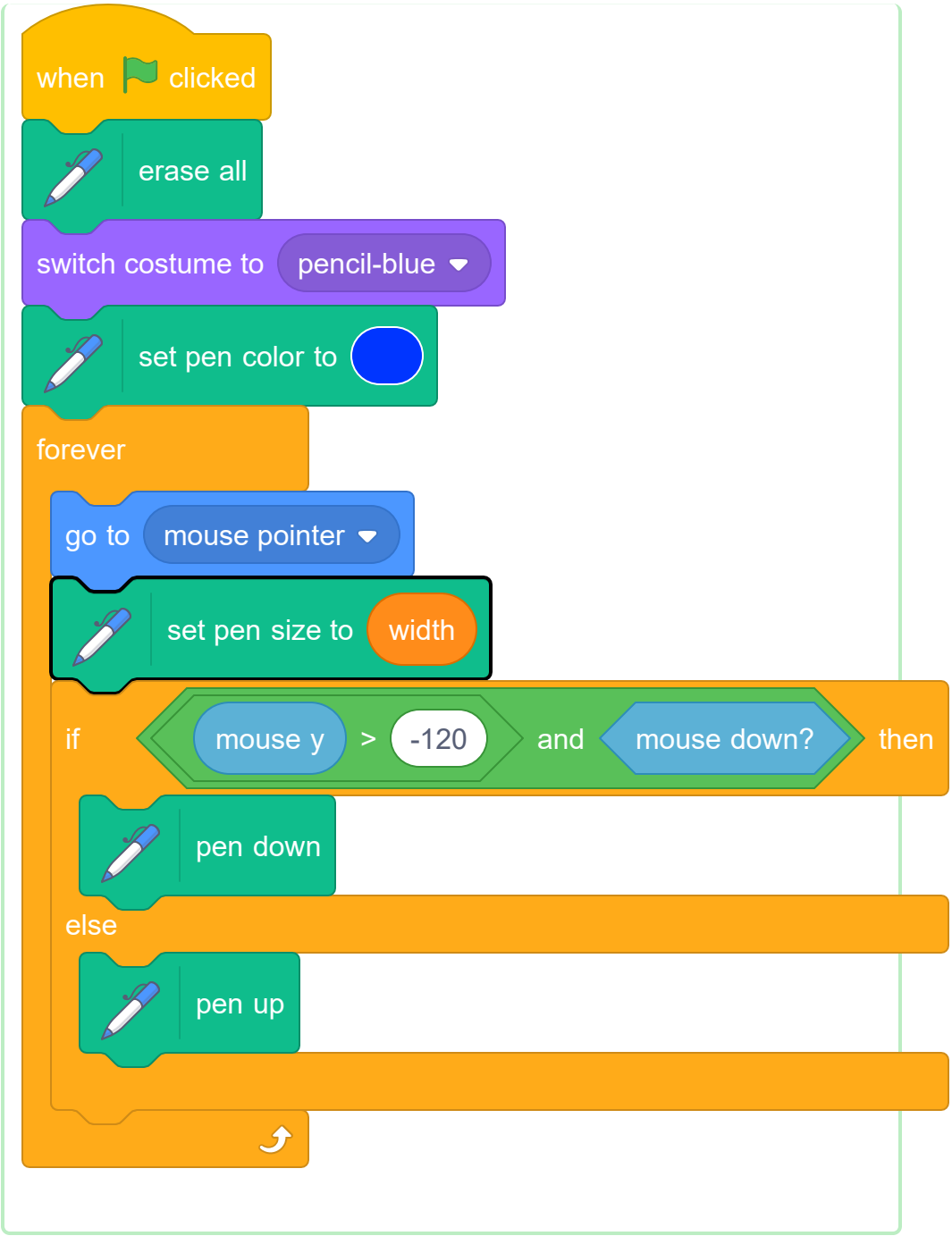
- Type in the name of your variable. You can choose whether you would like your variable to be available to all sprites, or to only this sprite. Press **OK**.



- Once you have created the variable, it will be displayed on the Stage, or you can untick the variable in the Scripts tab to hide it.

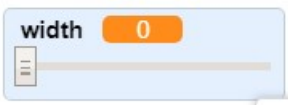


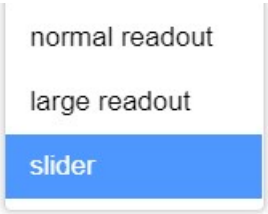
Add this line **inside** the `forever` loop of the pencil sprite's code:



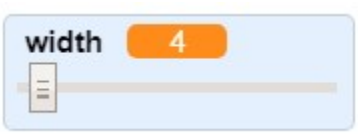
The pen width now repeatedly gets set to the value of the `width` variable.

Right-click on the `width` variable displayed on the Stage, and then click on **slider**.

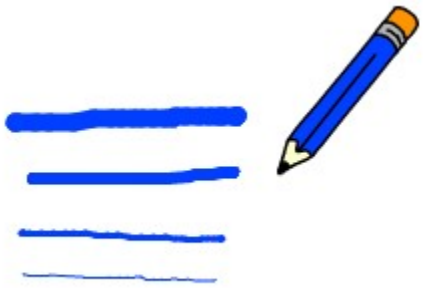




You can now drag the slider that is visible below the variable to change the variable's value.



Test your project and see if you can add code to adjust the pen width.



Challenge!

Challenge: keyboard commands

Can you add code so that, instead of clicking on the coloured squares or buttons on the Stage, you can make things happen by pressing keyboard keys? For example:

- b = Switch to blue pencil

- g = switch to green pencil
- e = switch to eraser
- c = clear screen

If you want to, you can also add code so that pressing the arrow keys changes the pen width.

Step 6 What next?

Now that you have completed the 'Paint box' project, try **the 'Boat race' project** (https://projects.raspberrypi.org/en/projects/boat-race?utm_source=pathway&utm_medium=whatnext&utm_campaign=projects), which helps you make a game where you have to stir a boat around obstacles.