

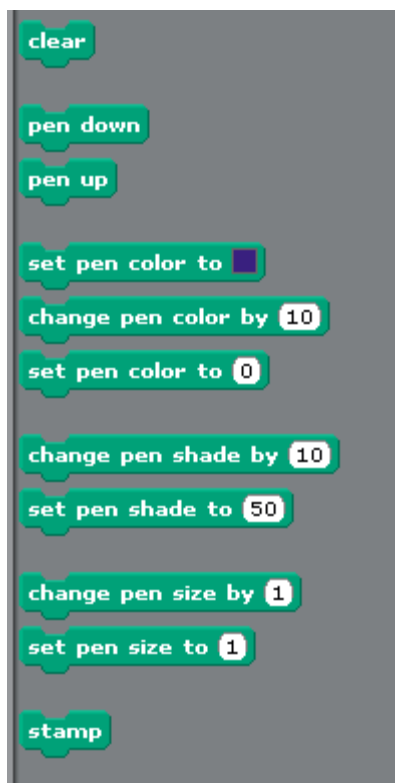
Scratch Shape Drawing Activity for CoderDojo

This activity is all about drawing shapes. You might think that drawing shapes is silly and easy, but because there are several different ways to draw the same shape, we can learn some interesting things about computer programming.

This activity assumes you have used Scratch once before or that you have a mentor nearby, or a parent, to guide you. Don't be afraid to ask for help, and remember to say hello to the coders sitting near you.

Drawing with Scratch

We'll start with the drawing commands available:



Clear wipes the stage clean for a new drawing

Pen up/Pen Down lift the pen up and down off the stage

In a sprite's script, if you put the pen down and move the sprite, it draws a line where it moved. If you pick the pen up, it stops drawing the line.

Set/Change Pen Colour allow you to change pen colour as you are drawing

Set/Change Pen Shade allow you to keep the pen colour but lighten or darken the shade of that colour

Set/Change Pen Size changes how thick the pen nib is

Stamp isn't really a drawing command so much as a way to stamp an image of the sprite in a certain place

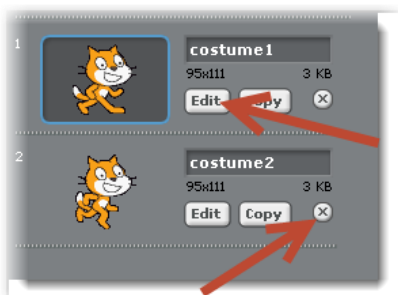
Drawing a Square

This will seem strange, but there are many different ways to draw a square! To start with, we need to change the default sprite (the orange cat) to a simple arrow, facing to the right. Here are the instructions:

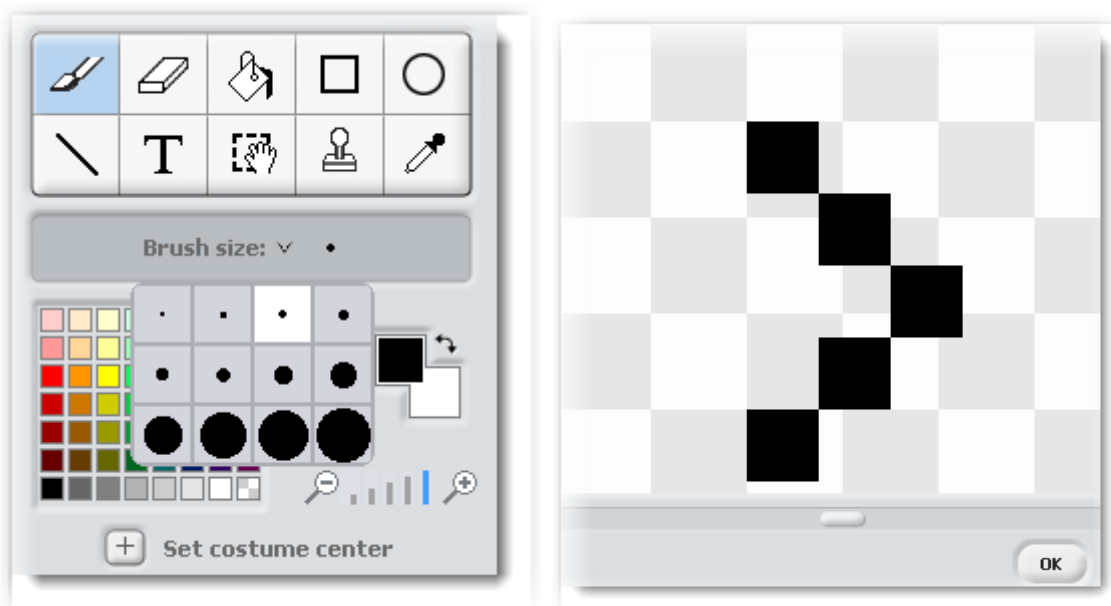
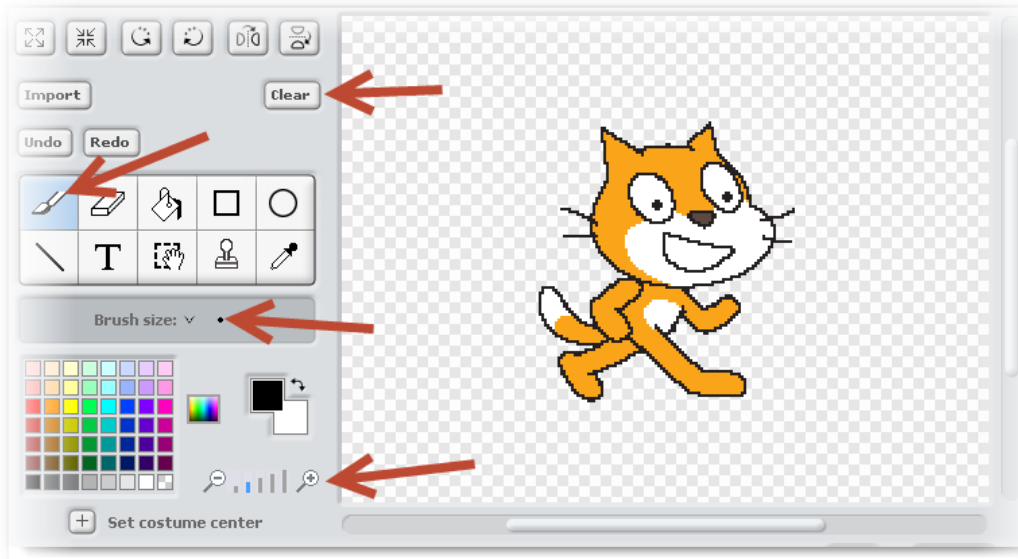
- Start a new Scratch project
- Click on the Cat Sprite, and then click on Costumes



- Click the X beside costume2 to delete it. Click on edit button on costume1, the paint editor should appear.



- d) Click the Clear button and now draw a simple arrow pointing to the right. The easiest way to do this is to select the first brush, then click the arrow for brush size and select the second or third smallest size. Then click the magnifying glass until the checkerboard pattern in the drawing area is very large. Now draw a simple arrow.



- e) Click OK to save the arrow

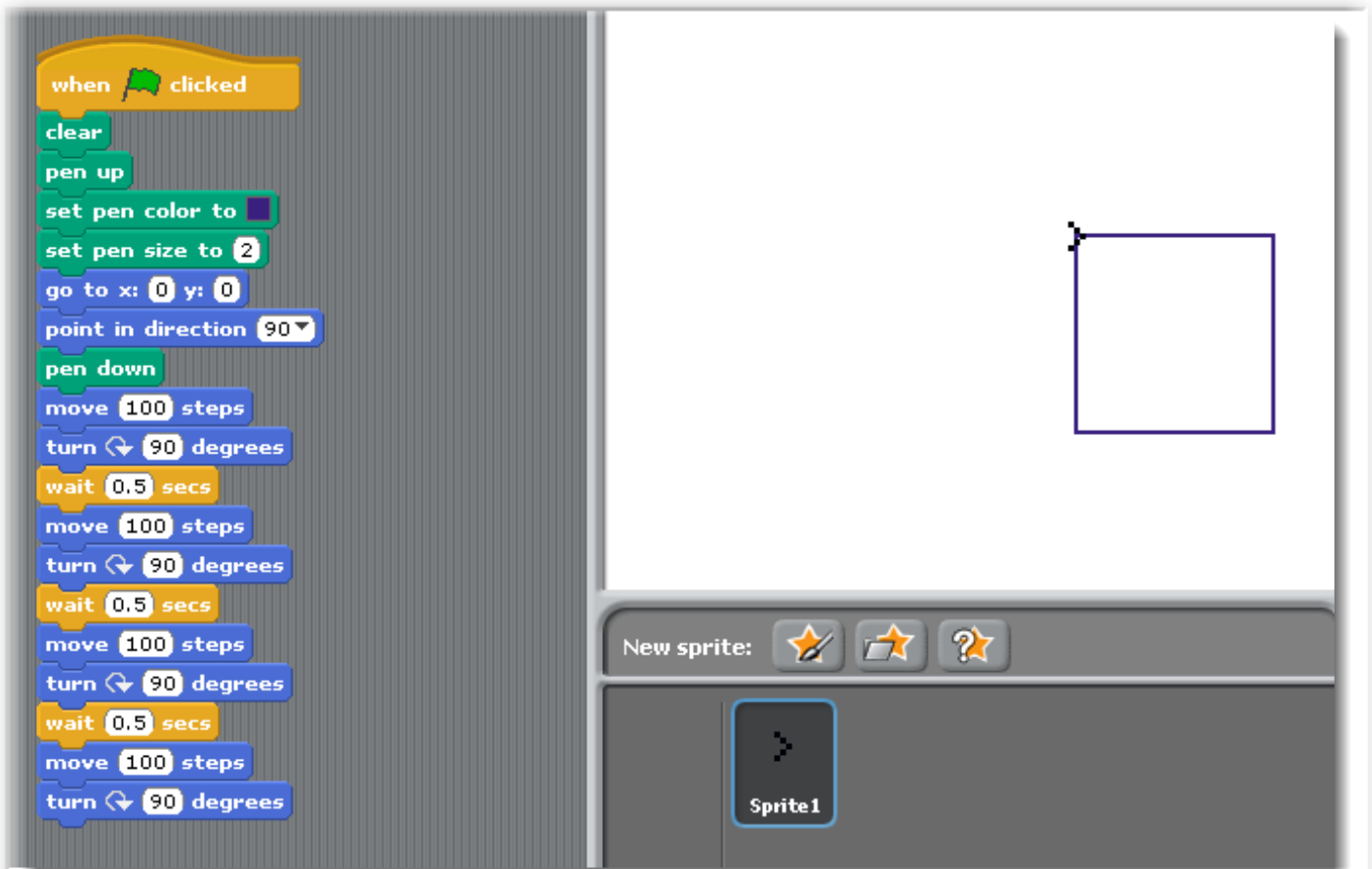
Our next step is to write a little script to draw the square. We are only using the **Control**, **Motion** and **Pen** commands, but if you haven't used Scratch before, you should ask a mentor to guide you. Also, at this point, the mentor may want to tell the coders all about degrees on a circle and the x and y axes in Scratch. Have a listen even if you already know all about degrees on a circle and x and y axes.

On the next page, we will have some Scratch scripts for drawing squares.

Square Scripts

Here are two different scripts for drawing a square, please try them one at a time and then try to figure out how they do what they do.

Script 1: No Repeats!

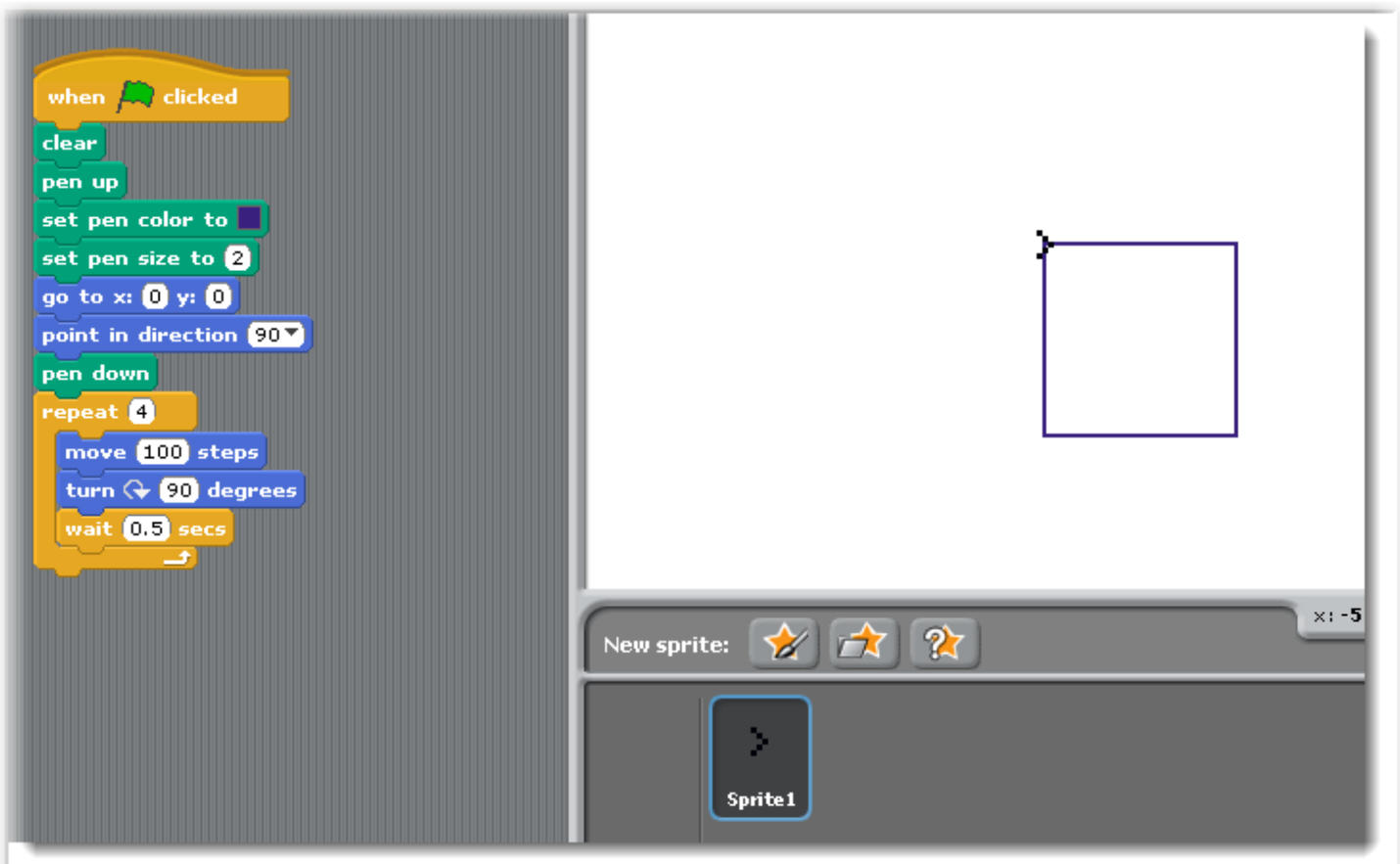


The image shows the Scratch interface with a script for drawing a square. The script is as follows:

```
when clicked
clear
pen up
set pen color to black
set pen size to 2
go to x: 0 y: 0
point in direction 90
pen down
move 100 steps
turn 90 degrees
wait 0.5 secs
move 100 steps
turn 90 degrees
wait 0.5 secs
move 100 steps
turn 90 degrees
wait 0.5 secs
move 100 steps
turn 90 degrees
```

The right side of the interface shows a stage with a square drawn in black. The bottom right corner shows the 'New sprite:' menu with 'Sprite1' selected.

Script 2: Repeats!



The image shows the Scratch interface with a script for drawing a square using a repeat loop. The script is as follows:

```
when clicked
clear
pen up
set pen color to black
set pen size to 2
go to x: 0 y: 0
point in direction 90
pen down
repeat 4
  move 100 steps
  turn 90 degrees
  wait 0.5 secs
```

The right side of the interface shows a stage with a square drawn in black. The bottom right corner shows the 'New sprite:' menu with 'Sprite1' selected. A small 'x: -5' label is visible in the top right corner of the stage area.

As you can see, the scripts do the same thing, but one uses a repeat and is much shorter. When coding, we like to do things with as few lines as possible so that the code is clear and easy to understand but also runs well. Don't make it too short though, as code which is hard to read is not very fun either.

Activity 1

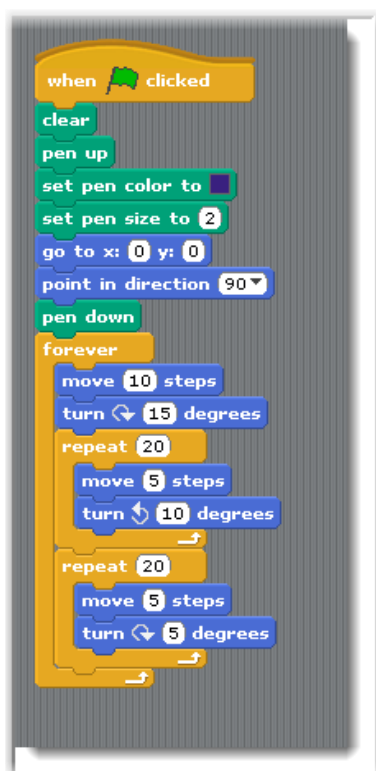
Using the code you have change only the repeat count, move steps amount and turn degree amount values. What shapes can you draw changing only those 3 numbers? Try 5, 50, 72. What shape does that draw?

Loops & Drawing

Now it's time to see what we can draw with a few different loops. Pay attention to which direction (clockwise or anti-clockwise) the arrow is turning in the *turn __ degrees* commands, as they have different effects depending on which you use:



We are going to create a script with more than one repeat, move and turn commands. This will help us make some interesting shapes. Remember to keep all of the script you already have up to *Pen Down*.



All the code to here is the same as before...

This section has 3 loops!

The first is a forever loop, it moves and turns

This is a repeat loop which moves and turns

This is a repeat loop which moves and turns

What does this draw?

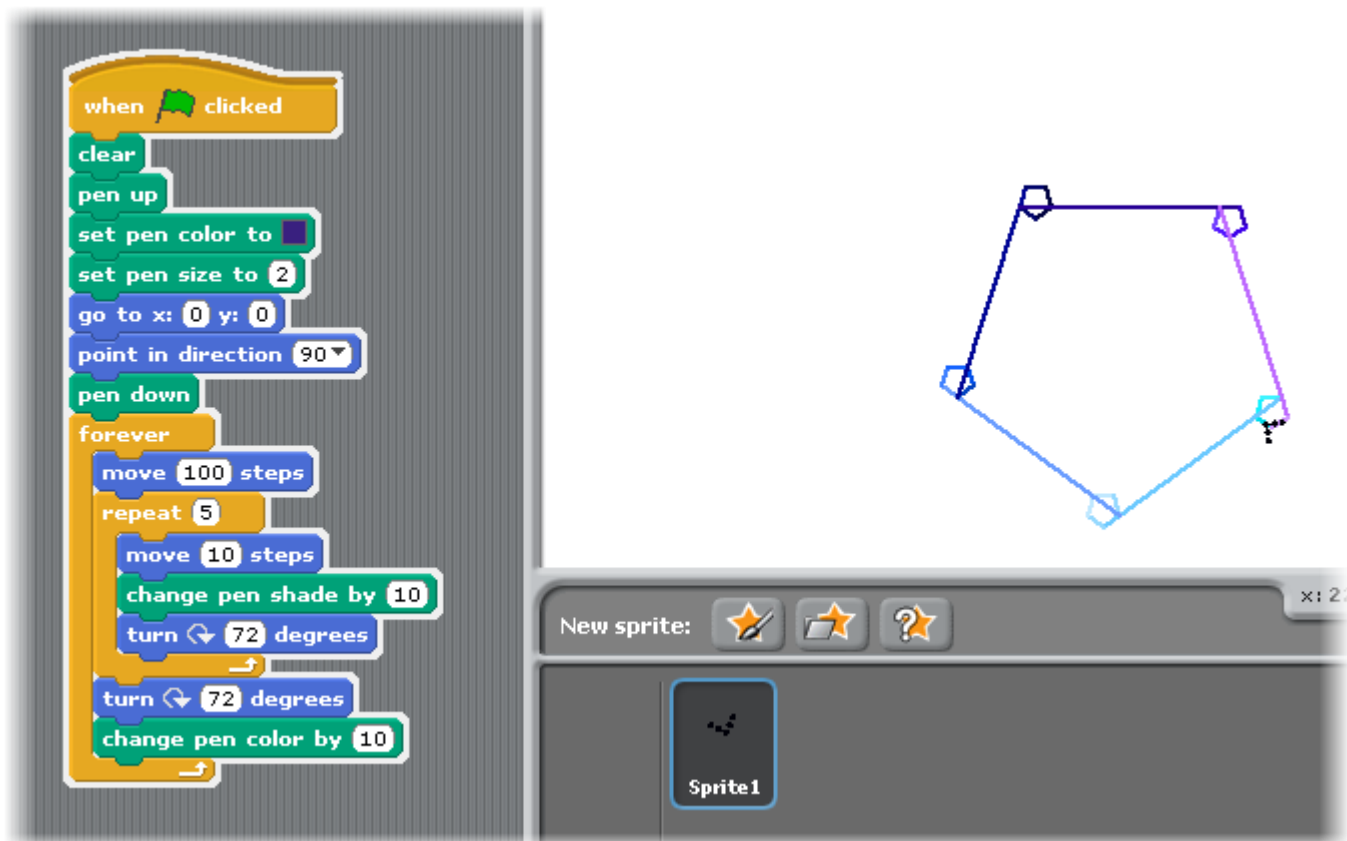
Activity 2

Using the code you have change only the values for the *Repeat*, *Move* & *Turn* commands. What shapes can you draw changing only those 8 numbers? Show the best shapes to the other coders. You might want to write down the numbers if you find a particularly cool one. What happens if you add the following blocks into your script (put them somewhere inside the forever block):



Different Loop Structures on Shapes

We can use any combination of loop we like to create different shapes. Here is an example of how we draw a 5-sided shape and every time we turn to draw the next side, we draw the same mini-size shape. Notice we only use 1 repeat loop inside the forever loop.



The image shows a Scratch script on the left and its execution on the right. The script starts with a 'when clicked' event, followed by 'clear', 'pen up', 'set pen color to' (dark purple), 'set pen size to 2', 'go to x: 0 y: 0', 'point in direction 90', and 'pen down'. A 'forever' loop contains: 'move 100 steps', a 'repeat 5' loop with 'move 10 steps', 'change pen shade by 10', and 'turn 72 degrees' (left), followed by 'turn 72 degrees' (left) and 'change pen color by 10' (right). The drawing on the right is a pentagon with a fractal-like pattern of smaller pentagons at each vertex, drawn in a color gradient from purple to blue.

Activity 3

Using the code you have, change the order of the commands (move the blocks around), add some repeats, change the values and see what you can draw now. Keep all the commands until *Forever* the same; just change the values and order of blocks inside the forever block. You can add new repeats if you like. Show your best drawings to the other coders.

I hope you enjoyed learning about coding through drawing shapes. If you would like more tutorials like this, please let your mentor know and they will let me know.

Stephen Howell