

# Spiralizer

Try out this spinning spiral project. Change the patterns using special sliders to alter the values of variables in the code. You control the art—the possibilities are endless!

## How it works

This simple project has only one sprite: a colored ball, which stays in the middle. Scratch's clone blocks make copies of the ball that move outward in straight lines. A spiral pattern forms because each clone moves in a slightly different direction, like water from a garden sprinkler. The Scratch pen draws a trail behind each clone, making colorful background patterns.

Adjust the sliders to change the look of the spiral.

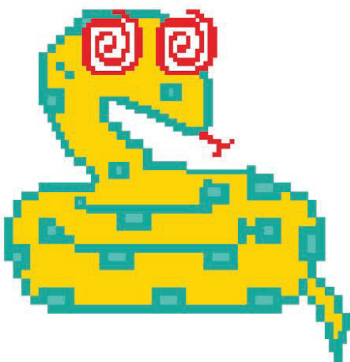


The clones' different directions make them form a spiral.

Each line is drawn using Scratch's Pen extension, which lets any sprite draw.

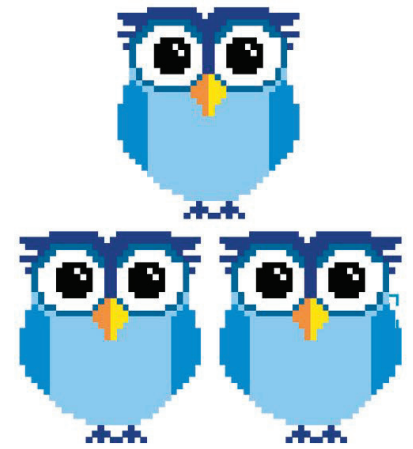
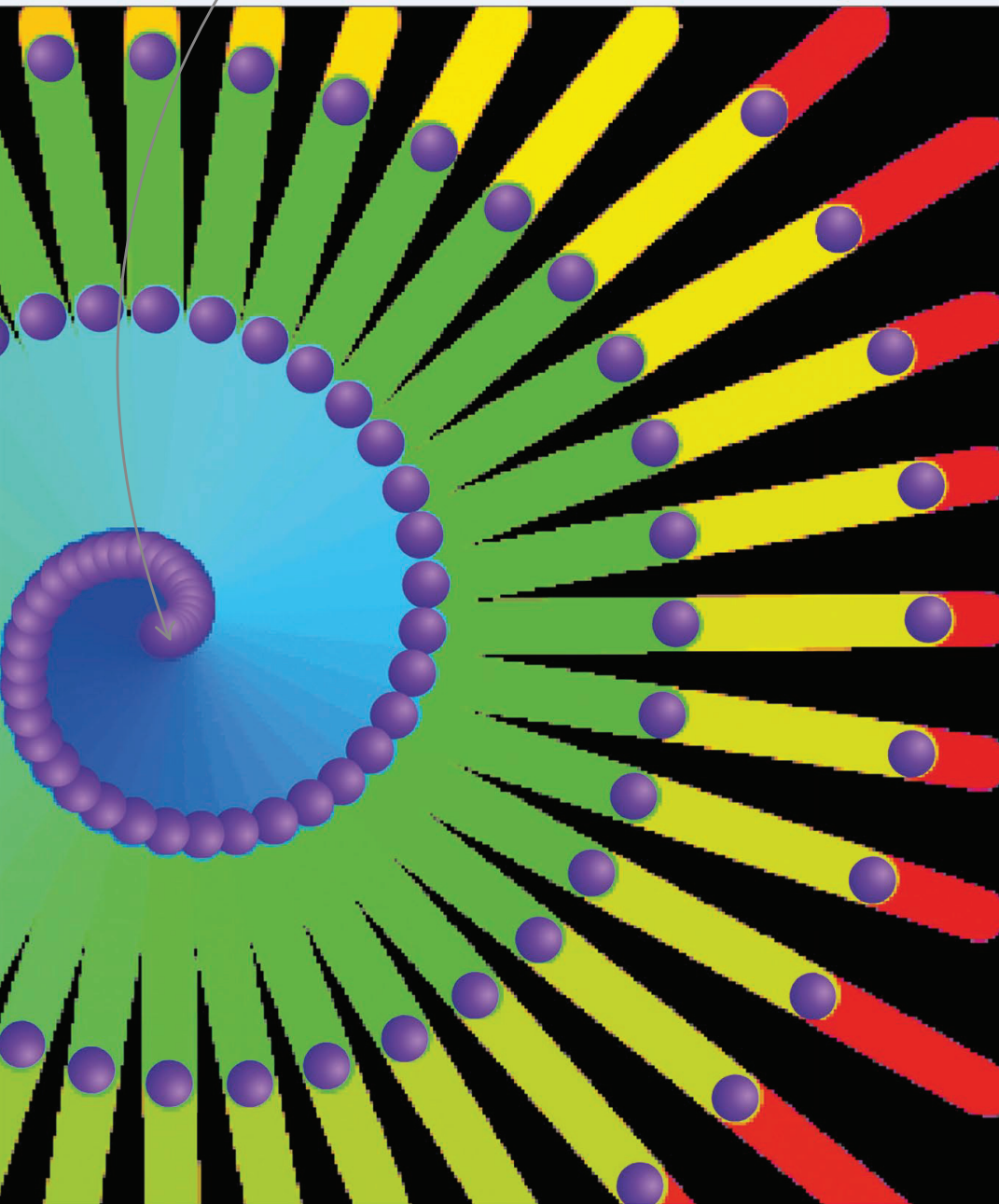
Each cloned ball flies in a straight line from the center to the edge.

Wow! This project has got me in a spin.



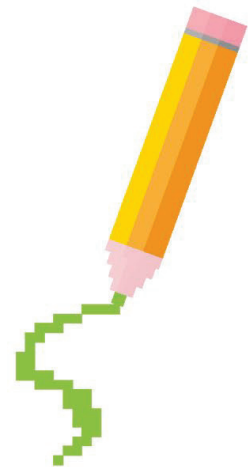
The ball in the center is the original sprite; all the others are clones.

Click this icon to switch from full-screen mode to editor mode.



### △ Clones

Clones are working copies of sprites. When a clone is created, it appears on top of the existing sprite and has the same properties, such as direction and size.



### △ Scratch pen

Every sprite can draw a trail behind it wherever it goes—just add the dark green “pen down” block to its code. By adding the Pen extension, you get extra blocks added to the blocks palette to change the pen’s color, shade, and thickness.

## Ball clones

Scratch allows you to create hundreds of clones from a single sprite, filling the stage with action. Each clone is a fully working copy of the original sprite but also runs some special code that affects only clones.

**2** Add this loop to make clones of the ball. When you run this code, nothing much will appear to happen. Actually, it's making lots of clones of the ball sprite, but they're all on top of each other. You can drag them apart with the mouse (but only in editor mode, not full-screen mode).

This shrinks the ball.

This block moves the ball to the center of the stage.

Each time this block runs, a new clone is made.

**4** The clones stop appearing after a while because Scratch won't allow more than 300 clones on the stage at once. Any instructions to make new clones after this are ignored. The clones stop forming at the center, and all the existing clones collect around the edge of the stage.

Once there are 300 clones on the stage, no more clones are created.

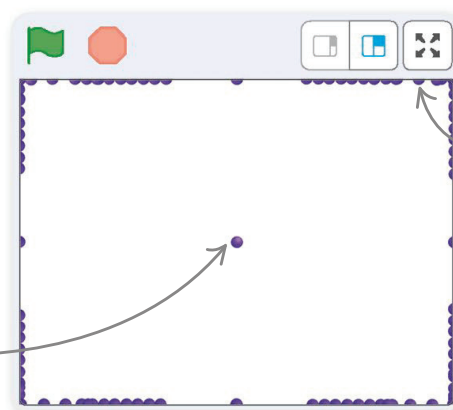
**1** Start a new project. Remove the cat sprite by right-clicking on it and selecting "delete". Load the ball sprite from the sprites library. The ball has several different colored costumes. Click the Costumes tab, and choose the color you like best.



**3** To make the clones move, add this code to the ball sprite. Every new clone will now run its own copy of this code when it appears. The code makes the clone move away from the center in the direction the parent sprite was pointing when it was cloned. Run the project.

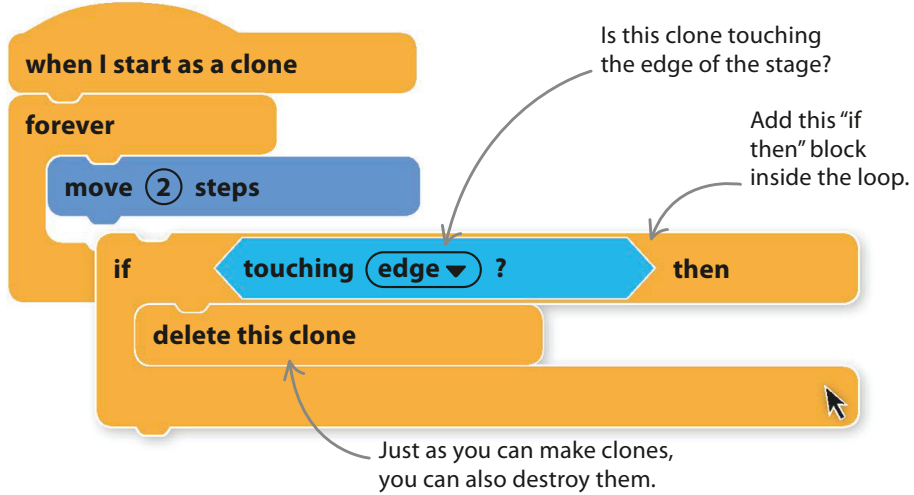
### ▷ What's going on?

The parent sprite changes its direction a little before each clone is created. As a result, the clones move off in slightly different directions, one after another. Each clone travels in a straight line to the edge of the stage, making the clones form an ever-expanding spiral pattern.

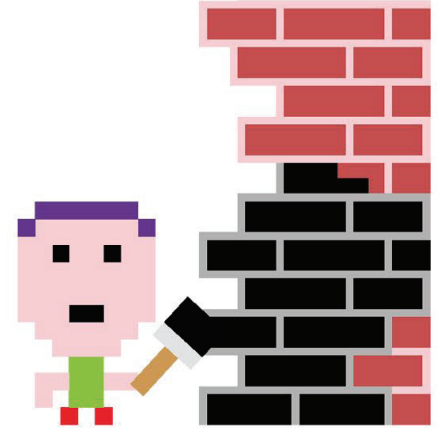


The clones collect at the edge because the "move" block can't take a sprite completely off the stage.

**5** To fix this problem, add an “if then” block inside the clone’s “move” loop to delete the clone when it gets to the edge. Run this version. Now the balls should disappear at the edge as fast as they are made, and the spiral should continue for as long as you want—Scratch will never reach its clone limit.

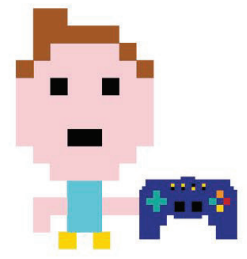


**6** To make the spiral show up better, add a black background. Click the paint symbol in the backdrops menu to the right of the sprites list to create a new backdrop. Use the fill tool to paint the backdrop solid black.

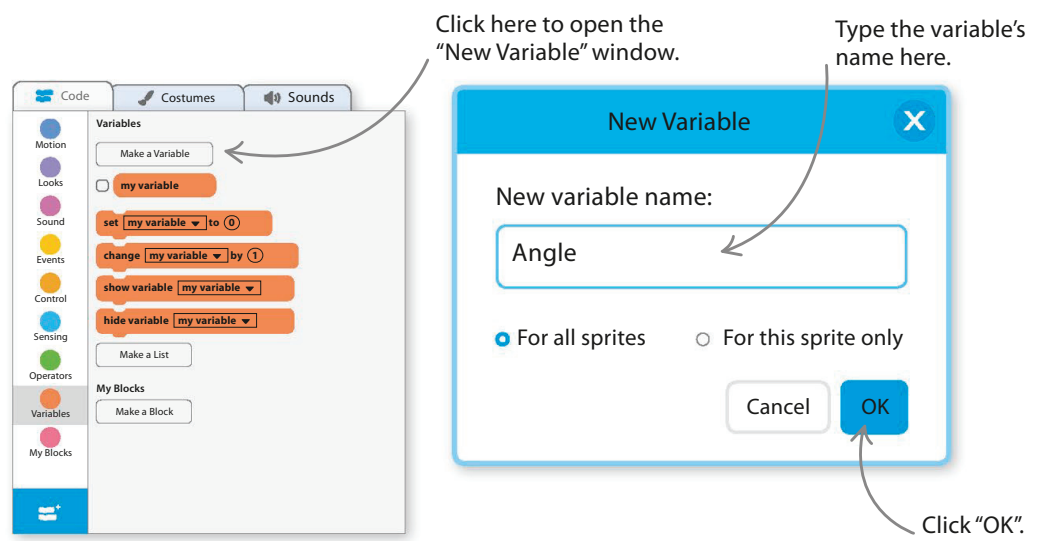


## Taking control

There are two numbers in the ball’s code that you can change to alter the spiral’s appearance. One is the change in the angle before each new clone appears. The other is the number of steps in the “move” block, which determines the clones’ speed. If you create variables for these numbers, Scratch lets you add a slider control to the stage so you can change them while the project is running. This makes experimenting easy.



**7** Select the ball sprite in the sprites list. Choose Variables in the blocks palette, and then use the “Make a Variable” button to create two variables: “Angle” and “Speed”.

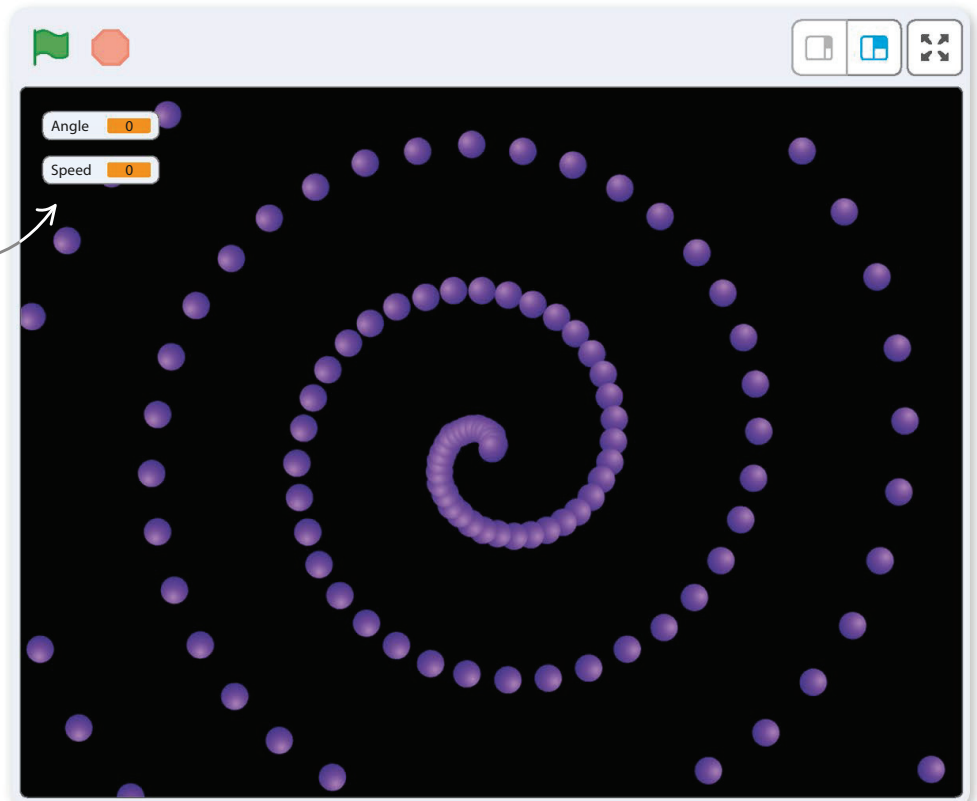


**8** Keep the variables checked in the blocks palette so that they appear on the stage.

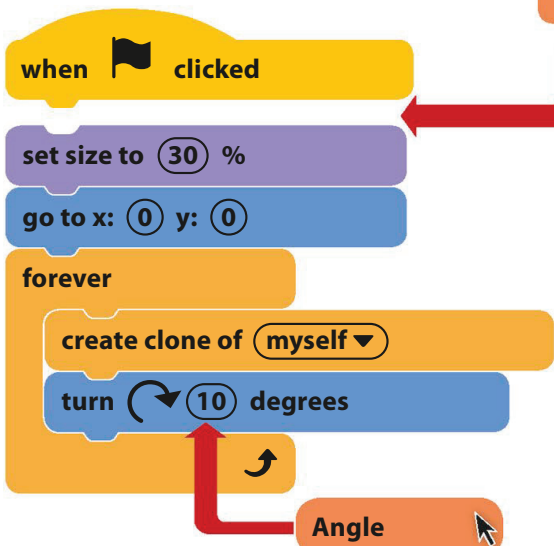
The variables are shown on the stage like this.



Leave the checks in these boxes.



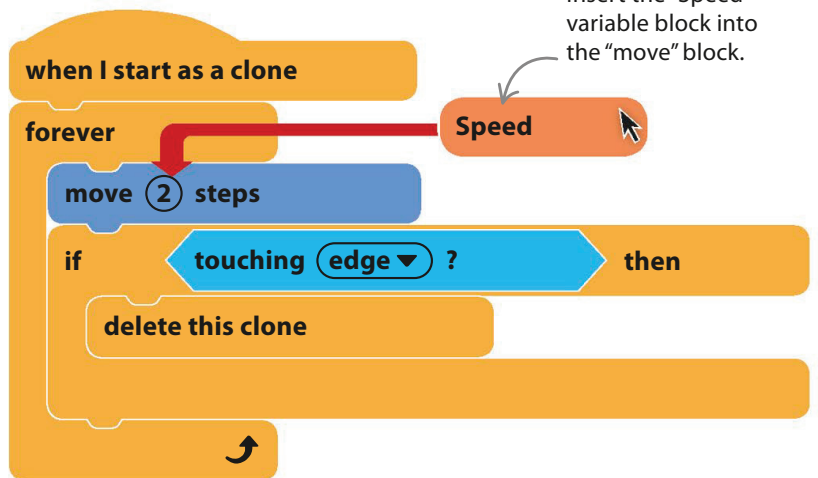
**9** Now change the ball's code to use the variables.



Insert the "Angle" variable block into the "turn" block.

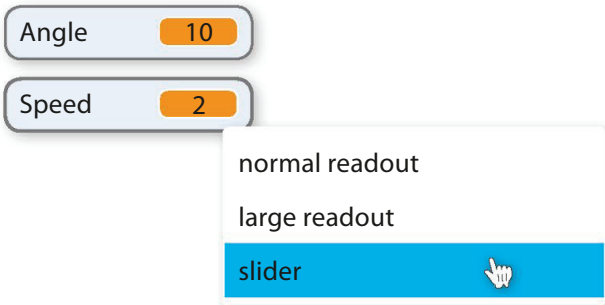


These blocks set the starting values for "Angle" and "Speed".

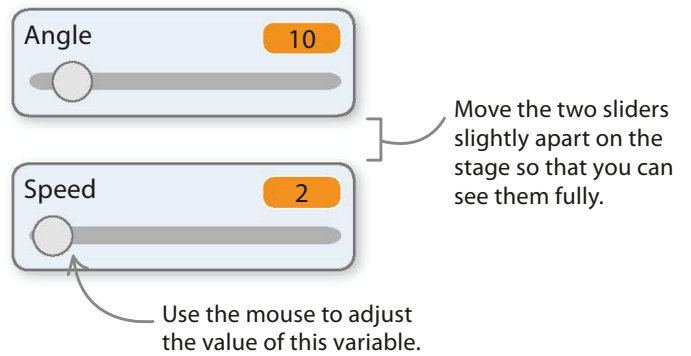


Insert the "Speed" variable block into the "move" block.

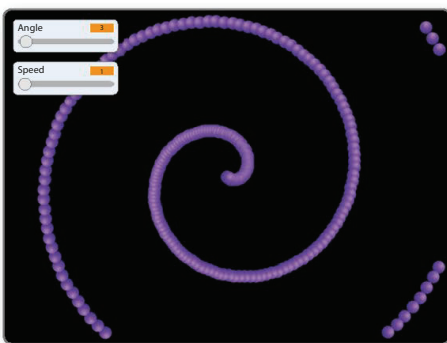
**10** Run the project, and everything should work just as before. Right-click on the "Angle" variable on the stage and select "slider". Do the same for "Speed".



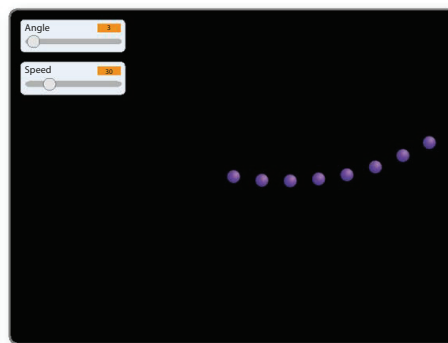
**11** Both variables will now have a slider control. The sliders let you instantly change the values stored in the variables. Run the project and try moving the sliders. The patterns of the ball clones will change instantly.



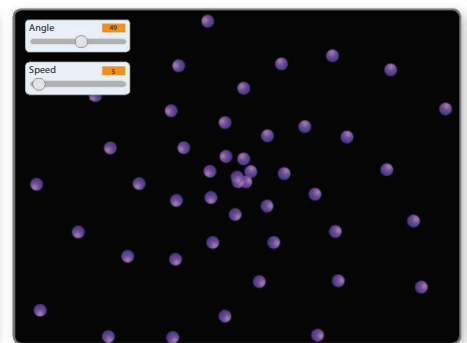
**12** Now try experimenting with different values.



Angle 3, Speed 1

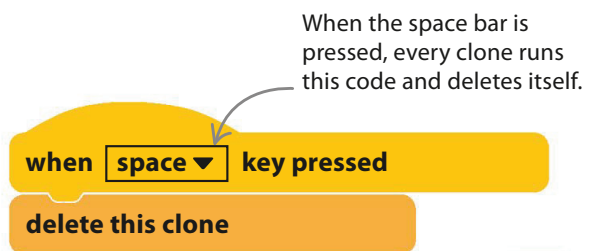


Angle 3, Speed 30



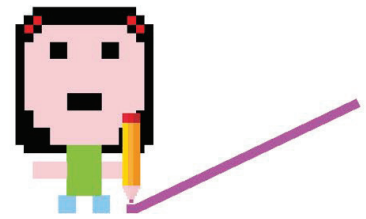
Angle 49, Speed 5

**13** You might find it handy to clear the stage of clones from time to time, so add this code to turn the space bar into a clone destroyer. Each clone runs all the ball sprite's code except the one headed by a green flag, so this code will affect every clone. Run the project, and tap the space bar to try it out.



## The mighty pen

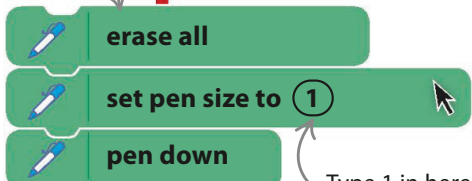
Scratch has extensions—extra blocks of code that can be added to projects. One of these extensions is a magic pen. If you switch the pen on, it will draw a line wherever the sprite goes. Every clone has a pen, too, so by turning them on you can create some amazing art.



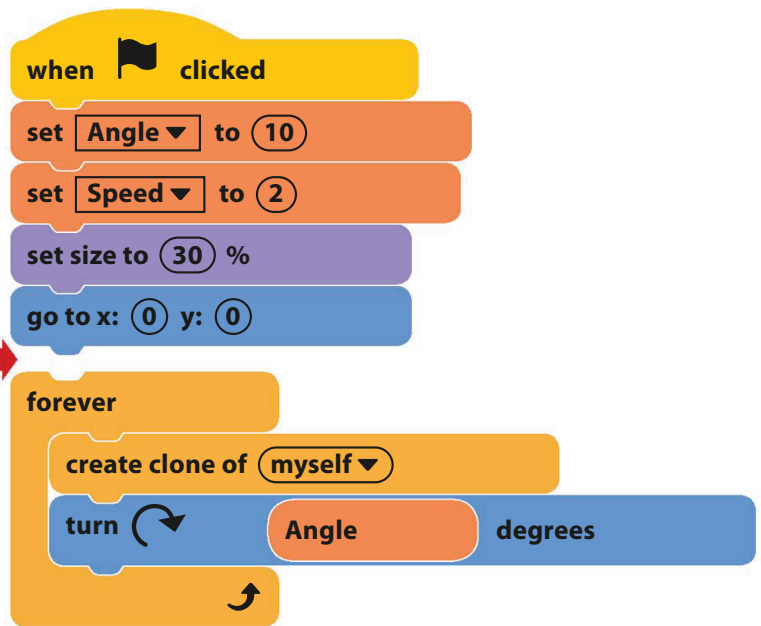
- 14** To add the extra Pen blocks, click “Add Extension” at the bottom left of the screen and choose “Pen”. Add these green blocks to activate the pen for every clone.

This block removes all pen trails so the stage starts blank.

This activates the pen so that every clone leaves a trail.

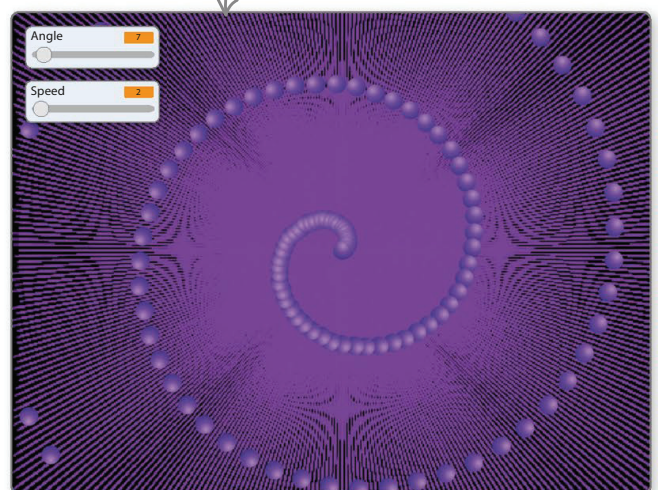
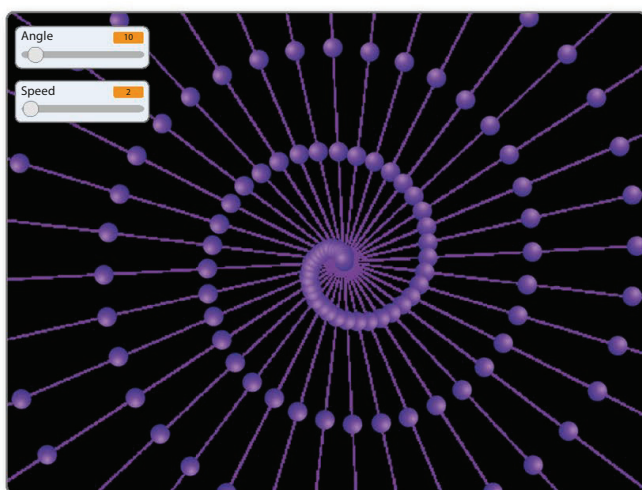


Type 1 in here for a thin pen.



- 15** Run the project to see a beautiful display. You can use the sliders to try different numbers. Odd numbers work well for “Angle”—try 7 or 11—because the whole pattern moves around a little each time, filling the space and creating interesting effects.

When many lines are drawn close to each other, imperfections line up and make strange swirls called “Moiré patterns.”



**16** Add an “erase all” block to your clone-destroyer code. This makes the space bar wipe the stage clear of everything, creating a blank canvas for your art.

```

when space key pressed
  delete this clone
  erase all
  
```

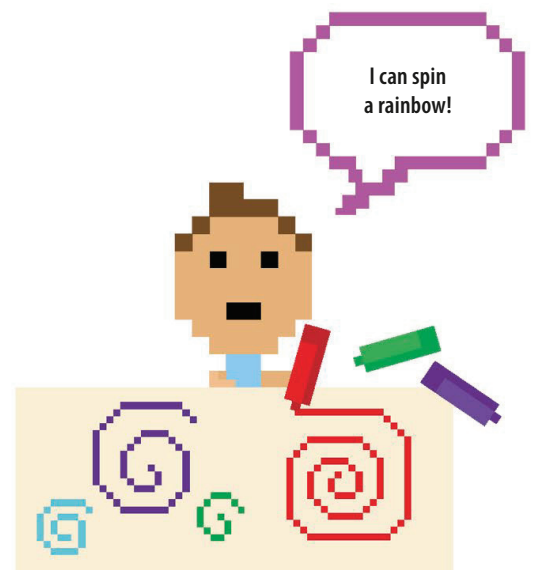
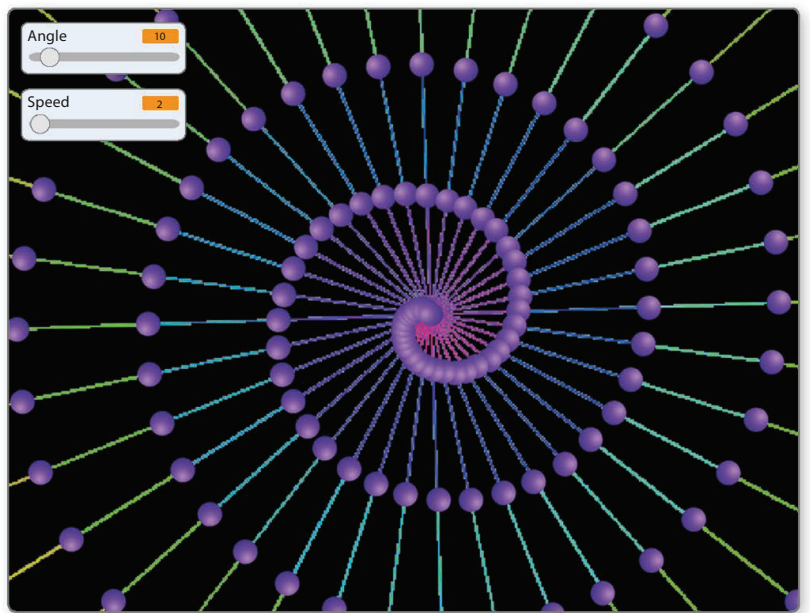
Insert an “erase all” block here to remove all pen traces from the stage.

**17** As a final experiment, change the pen color for each clone so that each one draws in a new color.

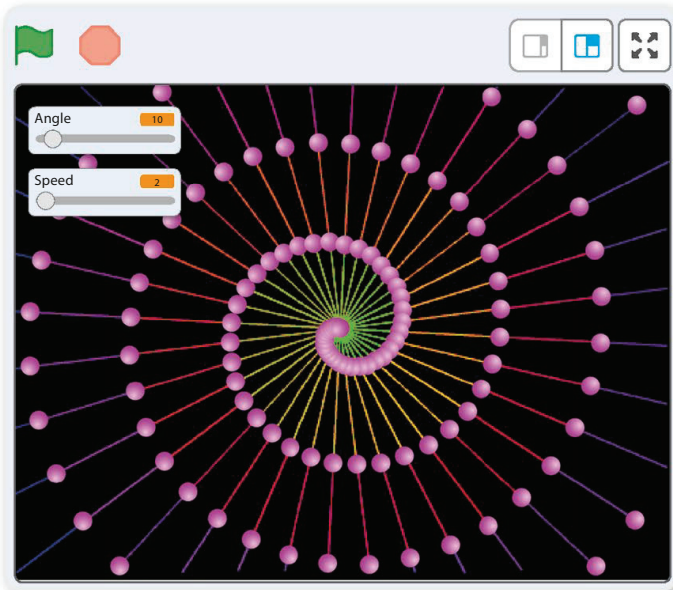
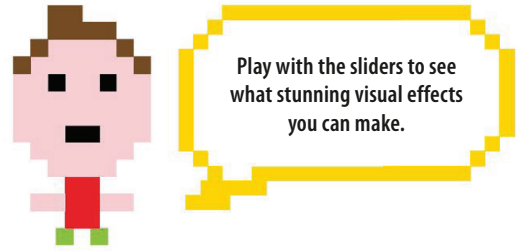
```

when clicked
  set Angle to 10
  set Speed to 2
  set size to 30 %
  go to x: 0 y: 0
  erase all
  set pen size to 1
  pen down
  forever
    create clone of myself
    turn Angle degrees
    change pen color by 1
  
```

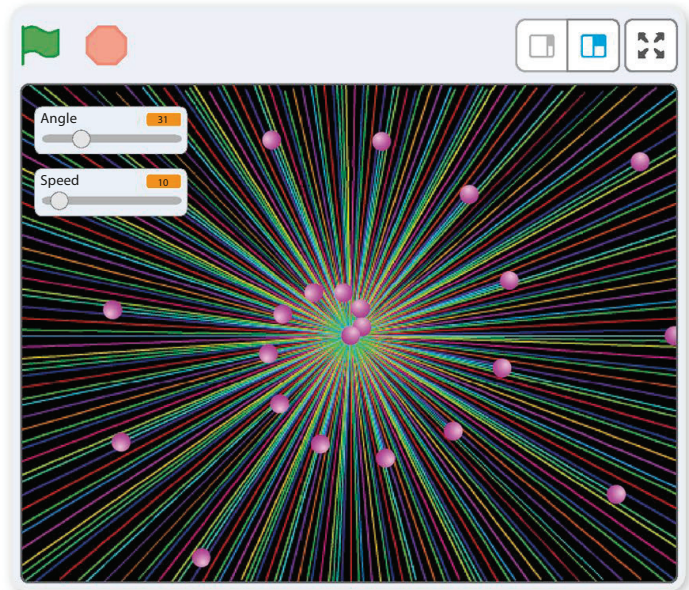
Insert this block to change the pen color for each clone.



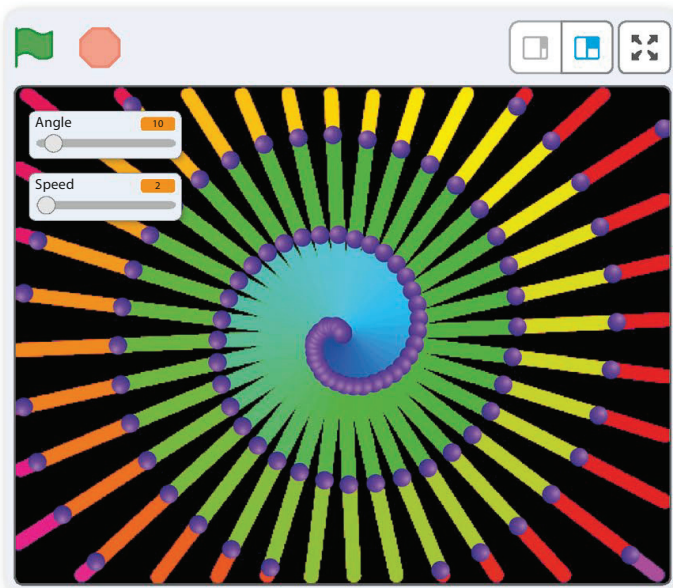
**18** Run the project and explore the range of effects you can create by changing the sliders, the pen size, and the pen's color. Try thicker pen sizes and see what happens. Don't forget you can clear up by pressing the space bar.



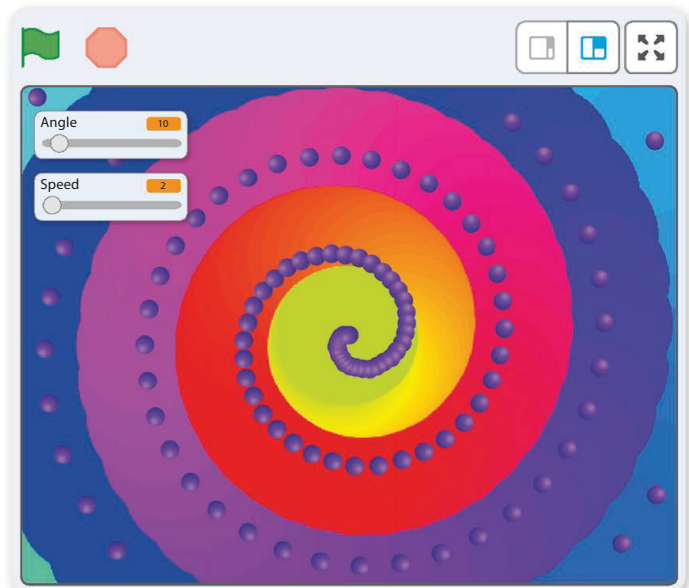
Pen size = 1, Angle = 10, Speed = 2



Pen size = 1, Angle = 31, Speed = 10



Pen size = 10, Angle = 10, Speed = 2



Pen size = 100, Angle = 10, Speed = 2

# Hacks and tweaks

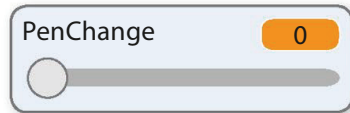
The spiral generator is perfect for customizing. Here are some more suggestions for changes, but don't be afraid to experiment with the code and try your own ideas. You could even adapt the project to make a game in which the player's sprite has to dodge the flying balls.

This project looks best in full-screen mode!



## ▷ Color control

You could make a new variable, "PenChange", with its own slider (as in step 10) to control how quickly the lines change color. Insert the new variable block in the "change pen color" block.



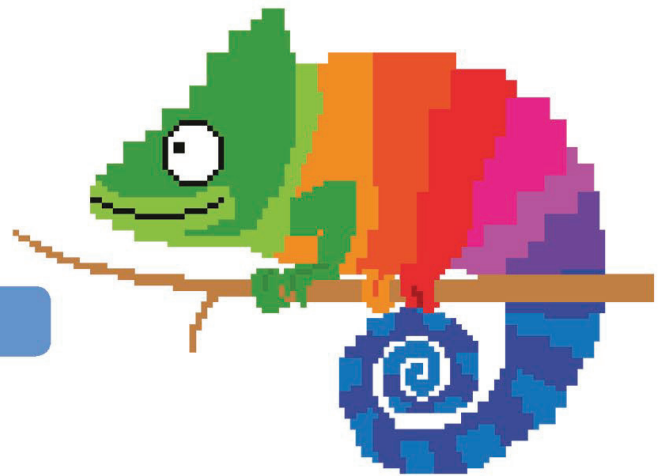
```

forever
  create clone of myself
  turn Angle degrees
  change pen color by 1
  
```

```

PenChange
  
```

Make a variable called "PenChange" and add it to the green block.



When you find a great spiral, copy the numbers from the sliders to make your preset code.

## ▷ Favorites

You can create keyboard shortcuts to set the spiral's variables to your favorite patterns. Then simply hit the keyboard shortcut to show someone your most dramatic creations.

```

when 1 key pressed
  set Angle to 7
  set Speed to 10
  
```

```

when 2 key pressed
  set Angle to 2
  set Speed to 1
  
```

▽ Turn it into art

Add these code blocks to hide the balls and sliders when you press the down arrow key and bring them back with the up arrow key. You can save the picture as an image file on your computer by right-clicking on the stage.

```

when down arrow key pressed
  hide
  hide variable Angle
  hide variable Speed
  
```

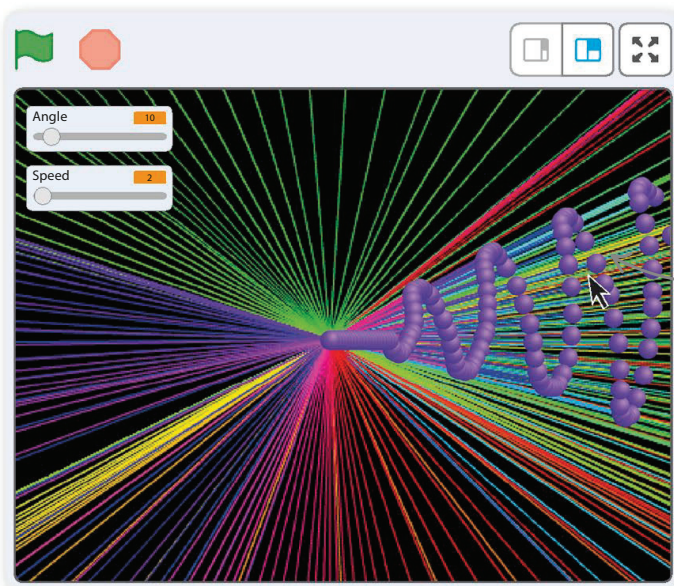
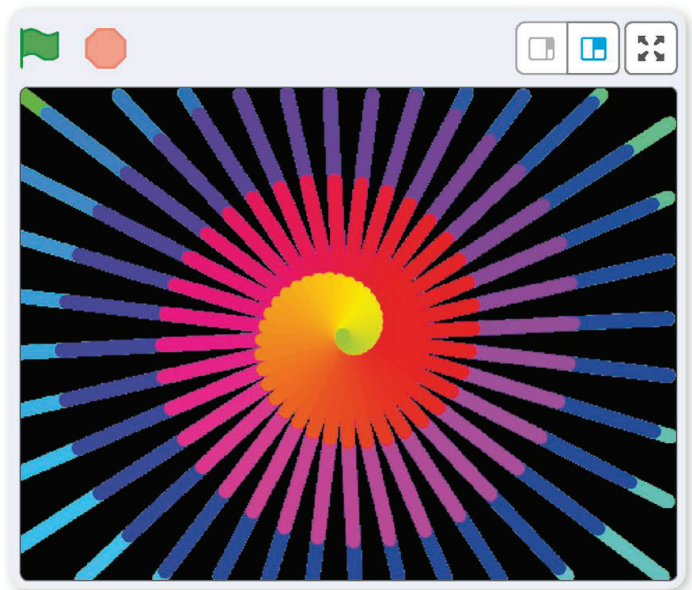
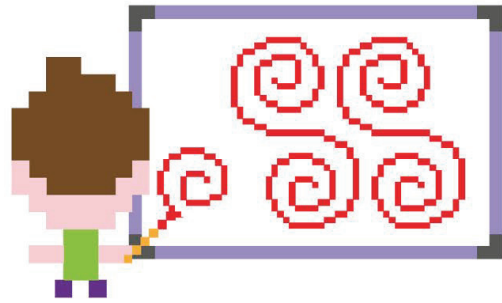
This block hides all the clones.

These hide the sliders.

```

when up arrow key pressed
  show
  show variable Angle
  show variable Speed
  
```

Remember that these code blocks run for all the clones on the stage.



◁ Ball control

Instead of generating clones in a spiral pattern, you can make them follow the mouse-pointer. Just replace the "turn" block with a "point towards mouse-pointer" block. Now try painting with the mouse.

Clones shoot out from the center toward the mouse-pointer.

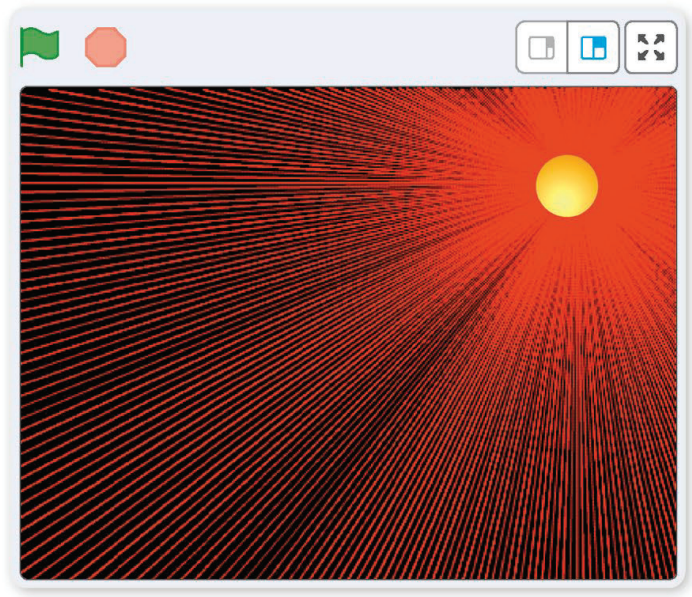
```

turn Angle degrees
point towards mouse-pointer
  
```

The first block (turn) is marked with a red X, indicating it is incorrect. The second block (point towards) is marked with a green checkmark, indicating it is the correct solution.

▷ **Sunset**

You can drag the original ball sprite anywhere on the stage and then hit the space bar to clear the old pattern. See if you can create the artificial sunset pattern shown here. Hint: you'll need a pen size of 1 and the "Angle" variable set to 7. Don't forget there's a "go to" block in the code that will reset the position each time the project is run—you can take that block out or change the coordinates once you've found a good sun position. You could even add another full-sized ball sprite in yellow to be the sun.



■ ■ **TRY THIS**

**Clone lab**

Experiment with clones to get a feel for how they work. Start a new project and add a clone creation loop to the cat, and then give each clone a simple bit of code to run when it starts. Experiment with a "pen down" block, or put random numbers in a

"go to x: y:" block to see some crazy effects. You can even add some keyboard controls and sound effects for fun. Once you've mastered clones, you'll find you can do all sorts of things in Scratch that are almost impossible without them.

```

when clicked
  repeat 10
    create clone of myself
    change color effect by 25

when I start as a clone
  point in direction pick random -180 to 180
  forever
    move 10 steps
    if on edge, bounce
  
```

