

COVERS
VERSION 2

SUPER SCRATCH

PROGRAMMING ADVENTURE!

LEARN TO
PROGRAM
BY MAKING
COOL
GAMES!

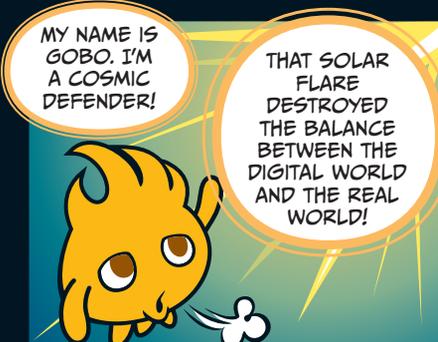
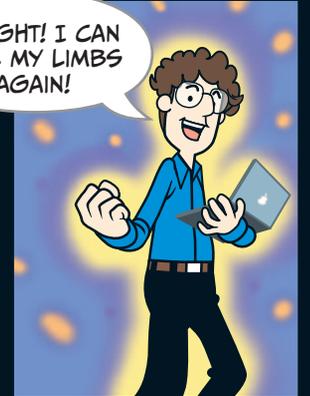


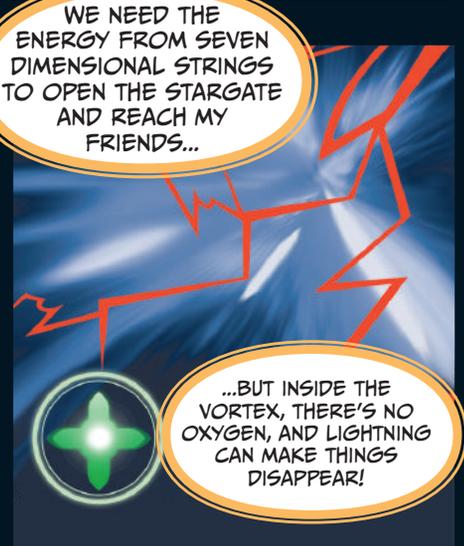
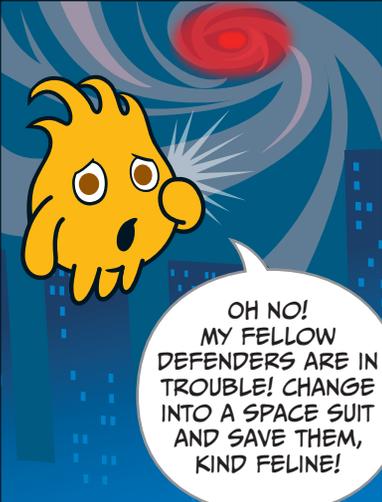
THE **LEAD** PROJECT



STAGE

2





2 STAGE

A SPACE ODYSSEY!

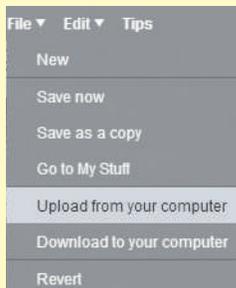
+ Chapter Focus

Learn to design new costumes and program a sprite's movements, reactions, and sound effects.

The Game

Avoid the lightning bolts and collect seven dimensional strings. Once you've got them all, the Monolith will appear!

To make things really easy, let's start by opening a blank project called **02 - A Space Odyssey.sb2**. This project has all the sprites you'll need, but none of the programming yet. To open a file, click **File ▶ Upload from your computer**.



But let's try making some sprites of our own, so you can make changes to this game's characters and invent your own games, too! Click Scratchy's sprite icon in the Sprite List, and then click the **Costumes** tab. You'll see the Paint Editor—just be sure to click the costume you want to change.

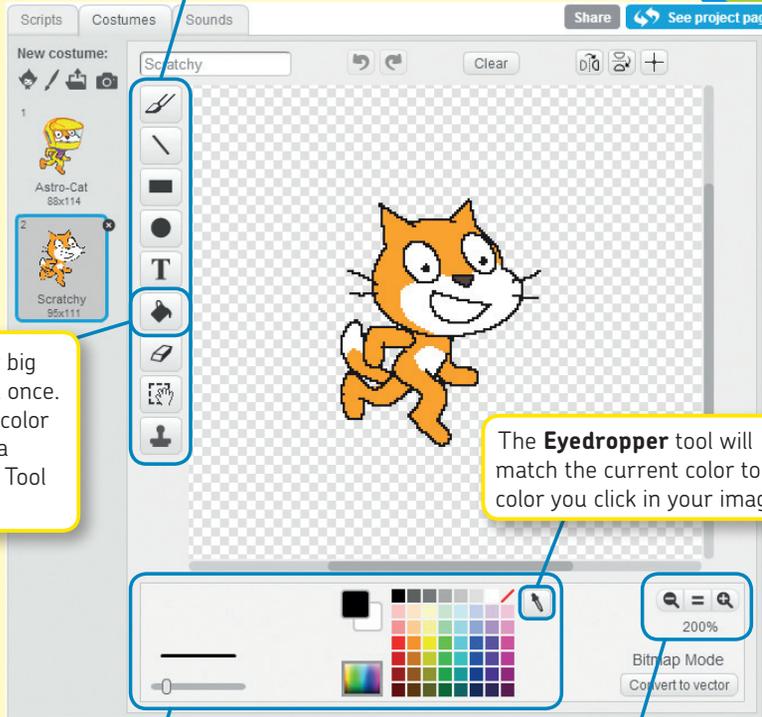
At the top of the Paint Editor, you can give your Costume a name. We can then reference the costume names in our programming.

If your Paint Editor looks different, it could be because you haven't opened the blank project file (*02 - A Space Odyssey.sb2*) that has Scratchy's astronaut costume.

Scratch has two modes for editing graphics—on the right is **Bitmap** mode. See page 38 to learn more about editing in Vector mode.



Here's where all the tools are. The **Brush** and **Eraser** tools make it easy to draw.



Use the **Fill** tool to color big parts of your drawing at once. You can choose a single color from the palette or use a gradient effect from the Tool Options.

The **Eyedropper** tool will match the current color to any color you click in your image.

Tool Options

Whatever tool you are using, the options for the tool will appear at the bottom of the Paint Editor. For example, the size of the Brush or Eraser can be adjusted if you want to make a big drawing or add fine detail. Just click and drag here to pick the right size.

You pick a color for your tool here, too.

Click the **Zoom** buttons (the magnifying glasses on the bottom right) to zoom in or out on your creations. This will make it easier to draw! Clicking the equals sign (=) shows you exactly how your sprite will appear on the Stage.

If you're not sure what a button does, simply hover your cursor over it, and a description will appear!

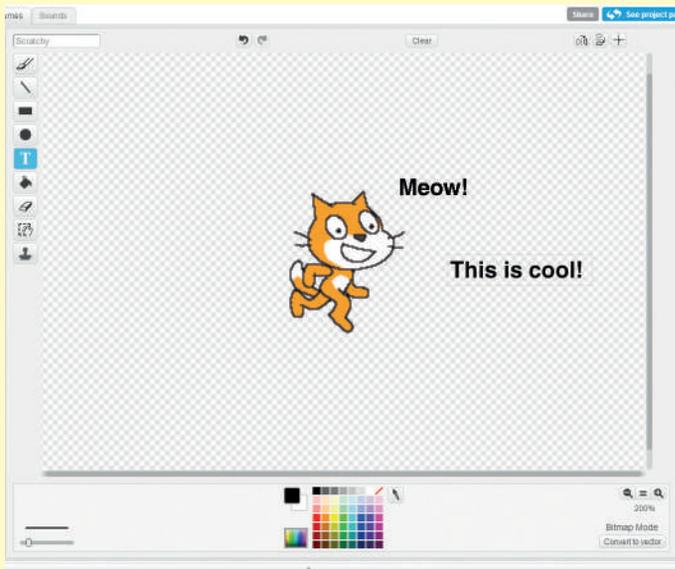
2 STAGE

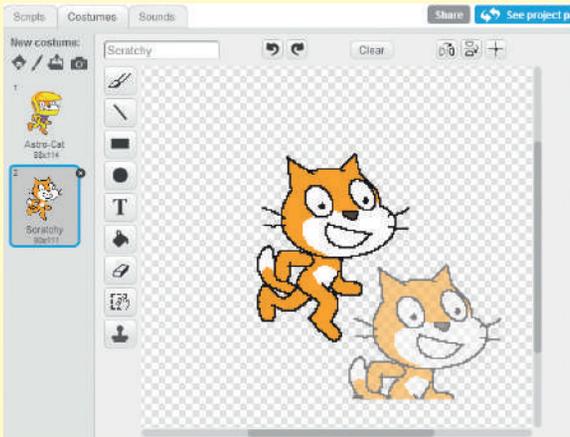
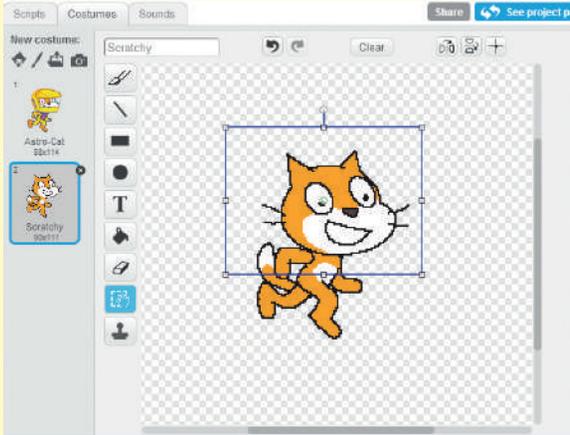
You also have tools to draw rectangles and ellipses. Can you give Scratchy a stovepipe hat like Abe Lincoln using the **Rectangle** and **Ellipse** tools?

These shapes can be empty inside or filled in. Try experimenting with different colors for the inside and outside. If you press the SHIFT key when you start to draw, you'll have a perfect circle or square! (You can also use this SHIFT trick when using the **Line** tool to draw a straight line.) Try rotating your shapes using the handle on the top of the box.



The **Text** tool lets you add writing to your sprite. We'll use this tool when we need to give the player instructions for our games. If you want to move the text, simply click and drag the black box that surrounds your text.

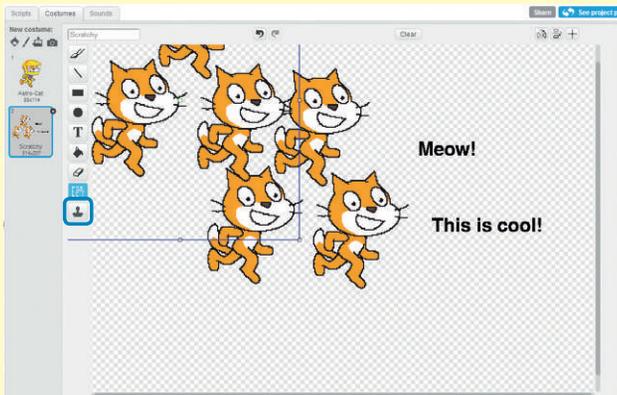




To use the **Select** tool, use your mouse to create a frame around a certain area. Then you can do all sorts of things to the selected part of your costume:

- Click and drag the selection to move it to a new location.
- Resize, smush, or stretch the image using the handles on the sides of the box
- Rotate the selection by clicking and dragging the handle at the top center of the box
- Press and hold the CTRL key and C key at the same time to copy the image area (Mac users can use ⌘-C instead). Then press CTRL-V to paste your selection, as many times as you like.
- Press the DELETE key to erase the selection.

The **Set costume center** button marks the center of your sprite. This helps to make sure your sprite doesn't end up in the wrong place when it spins or rotates!



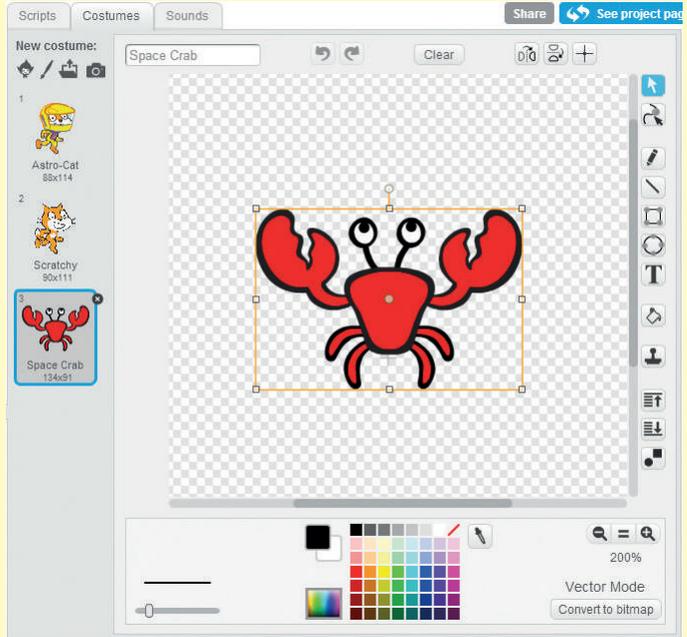
By using the **Duplicate** tool, you can copy and stamp a selected area as many times as you want! Just draw a frame around the area you want to copy and then click wherever you want to paste.

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Vector Mode

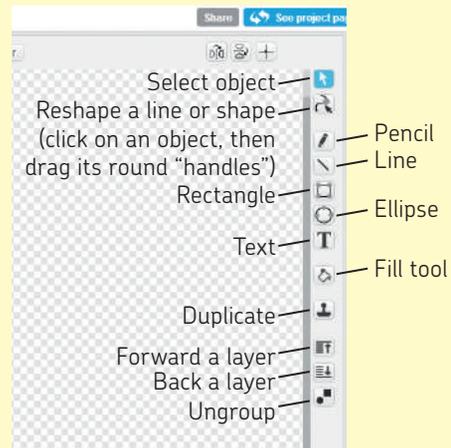
You may have noticed that when you edit other sprites in Scratch, you don't see the same Paint Editor tools. Some newer sprites are *vector* art—that's just a fancy way to say they're made of shapes, instead of pixels. Vector art have small filesizes, but they are great quality—and they can be resized without losing quality.

Note: For simplicity's sake, all of the graphics in this book use Bitmap mode. But your custom projects can use a mix of vector and bitmap graphics.

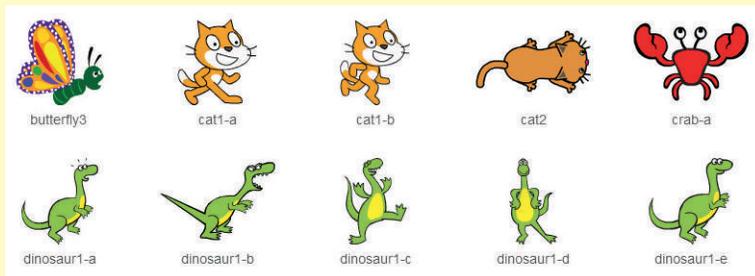


You can switch from Scratch's **Bitmap** mode (the one seen earlier) to **Vector** mode by clicking the **Convert to Vector** button at the bottom right of the Paint Editor. The difference between using these two tools in Scratch is like the difference between Adobe Photoshop and Illustrator—or GIMP and Inkscape. Use whichever Paint Editor mode you like the most!

You can import SVG files into Scratch's vector editor. In Vector mode, you can squeeze and shape lines, reshape, and ungroup. Here's how the Vector mode works.

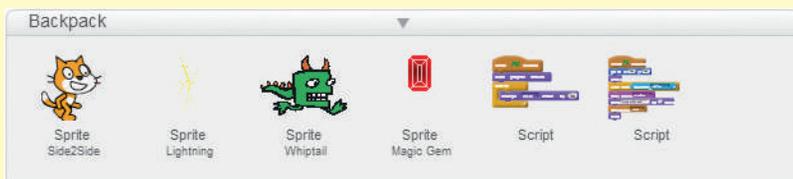


Try opening a vector graphic from Scratch's library, and give editing one a try.



The Backpack

Here's a cool new feature. If you're logged into the Scratch website, you'll see something called the **Backpack** at the very bottom of the screen. Click it, and it'll open up. Yours will be empty until you throw some sprites in it.



Your Backpack lets you share sprites and scripts between projects. If you play a really cool game on the Scratch website and want to use the character in an entirely new project, just click and drag the sprite right into your Backpack.

When you create a new project of your own, just open the Backpack again and drag the sprite out. You can write all new programs, or use the ones that were already with the sprite. You can even use your Backpack to store programs you want to reuse!

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Once you know how to use the Paint Editor's tools, Scratchy can put on his space suit! Go ahead and draw your own, or use the costume that's already in the project.

Because we've selected the horizontal rotation style (circled below) Scratchy will face only left and right.



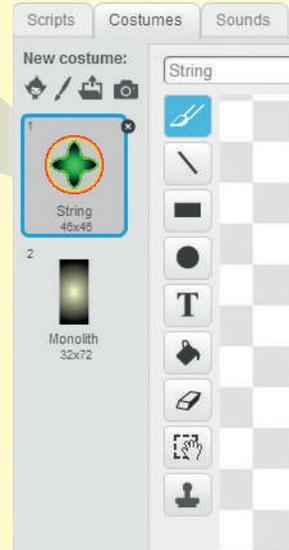
Now we have the main character for our game: Scratchy the astronaut!



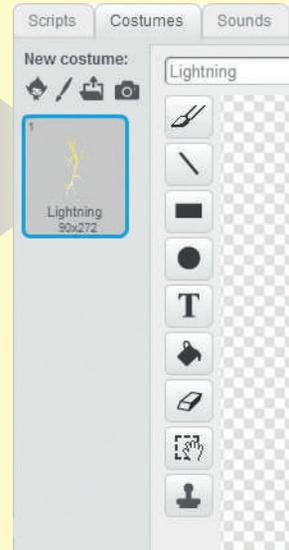
Next, let's take a look at the other sprites in the game. You can use the art that's already in the game, or draw new artwork yourself! Click  to draw a new sprite.



First, take a look at the String and the Monolith. They are two costumes for the same sprite, **String**. If they were two separate sprites, we'd have to write two programs. But now we can make this sprite switch costumes and write only one program.



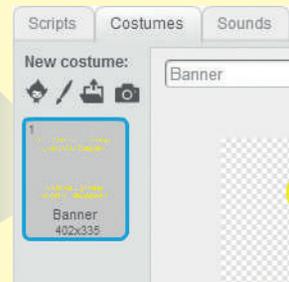
Now for our third new sprite, some scary **Lightning**! The player will need to avoid the lighting.



We also need some instructions to appear at the start of the game. We'll call this sprite **Banner**.

Get 7 Dimension Strings
to open the Stargate!!

Avoid the Lightning
or you will disappear!!



2 STAGE

Next, let's look at the Stage. I used artwork of a black hole from NASA! You can draw a new backdrop if you like. Click the Stage in the Sprite List, and then click the **Backdrops** tab.



Now that we have a bunch of sprites for the game, you can see how everything appears in the Sprite List. To give a sprite new instructions or costumes, you'll first have to click it in the Sprite List. Let's start by giving Scratchy the astronaut his programming.

Let's write our first program **1** for Scratchy! Make sure he's selected in the Sprite List and you've clicked the **Scripts** tab. His first program is a short one that makes him bounce up and down a little. This makes him look like he's floating in zero gravity!



```
2 when green flag clicked
  point in direction 90
  go to x: 0 y: 0
  wait 1 secs
  forever
    if key up arrow pressed? then
      change y by 15
    if key down arrow pressed? then
      change y by -15
    if key left arrow pressed? then
      point in direction -90
      change x by -15
    if key right arrow pressed? then
      point in direction 90
      change x by 15
```

For program 2, we'll make a *conditional*—if something is true, then something else will happen. In the **Control** palette, drag out an **if** block. Then for the diamond shape, drag the **Sensing** block **key pressed?**. Right below the **if**, put what you want to happen when the statement is true. Drag out the rest of these commands to form the complete program. Now you can move Scratchy up, down, left, and right by using the keyboard!

Now we'll give Scratchy two more programs. We'll need to program them individually, and then use **When green flag clicked** to make them all run at the same time.

Let's write programs 3 and 4. Click the **Control** and **Looks** palettes and drag out these commands.

Program 3 controls which costume Scratchy wears, and program 4 makes Scratchy become invisible like a ghost each time he gets struck by lightning.

When you've finished all of this, Scratchy's programming is complete!

```
3 when green flag clicked
  switch costume to Astro-Cat
  forever
    go to front
```

```
4 when green flag clicked
  clear graphic effects
  forever
    if touching Lightning? then
      repeat 10
        change ghost effect by 1
```

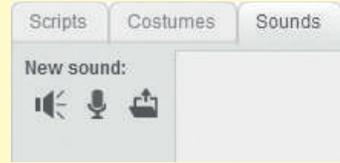


Next, let's click the **Banner** sprite. We just need a simple program to make these instructions appear at the start of the game. The **repeat 2** loop using the **show** and **hide** blocks makes our instructions flash, so the game is even more exciting.

```
when green flag clicked
  hide
  go to x: 0 y: 0
  go to front
  repeat 2
    show
    wait 0.4 secs
    hide
    wait 0.1 secs
```

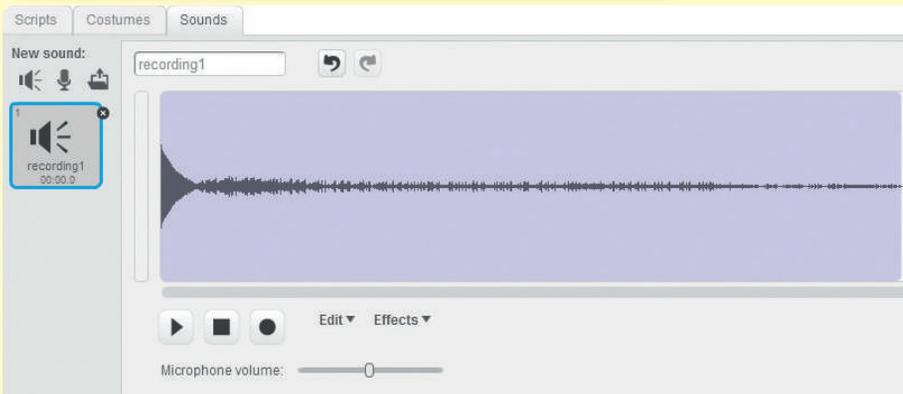
2 STAGE

Now we can add sound effects to the game! I've already added a few, but you can change things up. First, click the **Stage** in the Sprite List. Then click its **Sounds** tab. You can create whatever kind of sounds effects or music you like for your Scratch projects. You can even record your own sounds right in the Scratch program.

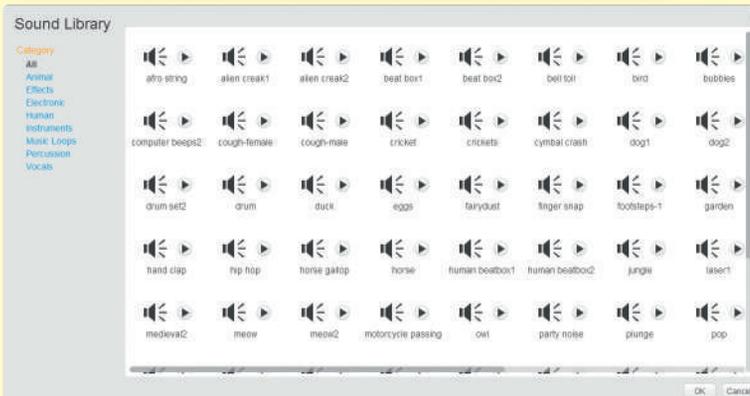


If you click the **Record** button, a sound recorder will pop up. You can click the round button to record speech or sound effects through a microphone. When you're finished, click **OK**.

Note: To record your own sounds, you'll need a microphone attached to the computer. To listen to sound effects and music, you'll need speakers.



If you want to use sounds that are prerecorded, you can press  to use Scratch's sound library, or  to choose files from your own computer (MP3 and compressed WAV, AIF, and AU formats are supported).



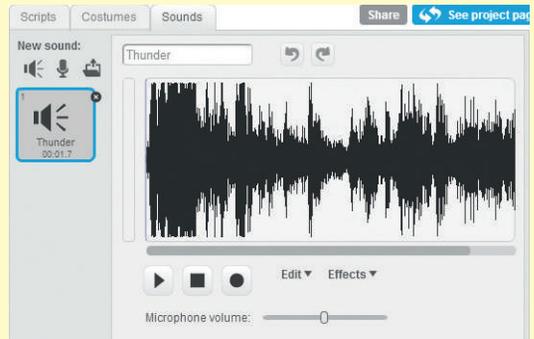
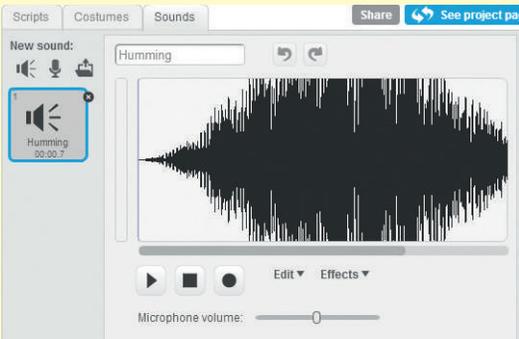
Now we can add some simple programs to the Stage. Program 1 makes its backdrop change colors. In program 2, use the **Sound** palette to add a song to the Stage.



```
1 when green flag clicked
  switch backdrop to Quasar
  forever
    change color effect by 25
    wait 0.1 secs

2 when green flag clicked
  forever
    set volume to 100 %
    play sound Techno1 until done
```

Next, we can add some sound effects to the String and Lightning sprites to make the game more exciting! Test how you like my sound effects, and make your own if you like.



You can record a sound yourself and then change it using the **Effects** menu. Try reversing what you record to make it sound really weird!

Click the **Lightning** sprite, and write a program so that whenever Scratchy touches a lightning bolt, a sound will play.

```
when green flag clicked
  wait 1 secs
  forever
    if touching Astro-Cat ? then
      set volume to 30 %
      play sound Thunder until done
```

2 STAGE

The **Lightning** sprite needs some more programs. Go to the **Control**, **Events**, **Looks**, and **Operators** palettes and program these commands to have the lightning bolt randomly grow bigger or smaller, making the game more magical.

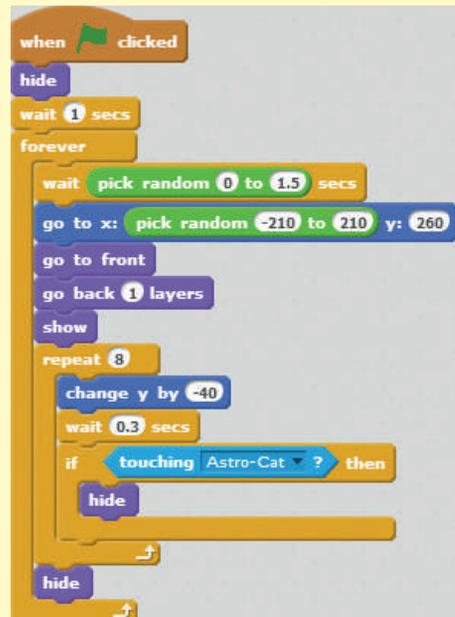


```
when green flag clicked
  forever loop
    set size to pick random 30 to 60 %
```

Next, write this program to make the lightning disappear whenever Scratchy touches it and to control the way it moves.

The lightning's vertical position (y-axis) changes because we repeat eight times the subtraction of 40 steps (-40) from its original y-coordinate of 260. To make the lightning move differently, you can change and play with these numbers.

So that the lightning bolt makes Scratchy disappear, we must make sure that each time it moves—that is, the position of its y-axis changes—the program will check if it touches Scratchy.



```
when green flag clicked
  hide
  wait 1 secs
  forever loop
    wait pick random 0 to 1.5 secs
    go to x: pick random -210 to 210 y: 260
    go to front
    go back 1 layers
    show
    repeat 8
      change y by -40
      wait 0.3 secs
      if touching Astro-Cat? then
        hide
    hide
```

Tip: Sometimes when you've used the **hide** and **show** blocks, a sprite can disappear while you're working on the program—running it, testing it, and checking for bugs. Simply click the **show** block in the **Looks** palette to make the sprite appear again. (You can also check the **show** box in the Sprite Information pane.)

Now it's time to program the **String** sprite. Make sure you click it in the Sprite List first! Program 1 makes it change color, just like our Stage. Program 2 will give it a simple animation, using the fisheye effect.

```
1 when green flag clicked
  clear graphic effects
  forever
    change color effect by 5

2 when green flag clicked
  forever
    change fisheye effect by 30
    wait 0.1 secs
    change fisheye effect by 30
    wait 0.1 secs
    change fisheye effect by -30
    wait 0.1 secs
    change fisheye effect by -30
    wait 0.1 secs
```

Now for a big program. Let's start by dragging out the blocks you can see in 3. These will control how the String costume spins and moves.

```
3 repeat until touching Astro-Cat ?
  change y by 1
  turn 5 degrees
  wait 0.1 secs
  change y by -1
  turn 5 degrees
  wait 0.1 secs
```

Then add to your program so that it looks like 4. This will make your dimensional string appear in a random place on the Stage seven different times. The `say` blocks and `play sound` blocks at the end of the program make sure the player knows he has grabbed a dimensional string.

```
4 repeat 7
  go to x: pick random 210 to -210 y: pick random 150 to -150
  show
  repeat until touching Astro-Cat ?
    change y by 1
    turn 5 degrees
    wait 0.1 secs
    change y by -1
    turn 5 degrees
    wait 0.1 secs
  say Got it!
  set volume to 30 %
  play sound Humming
  wait 0.2 secs
  say 
  hide
  wait 0.3 secs
```

We're not done yet!
This is a big script.

Add a **When clicked** block at the top of our script and some instructions at the very bottom so that once Scratchy has collected seven dimensional strings, the String sprite will change to its Monolith costume. When that happens, the player wins the game. Make sure your finished program looks like **5**.



```
when clicked
switch costume to String
hide
wait 1 secs
repeat 7
  go to x: pick random 210 to -210 y: pick random 150 to -150
  show
  repeat until touching Astro-Cat
    change y by 1
    turn 5 degrees
    wait 0.1 secs
    change y by -1
    turn 5 degrees
    wait 0.1 secs
  say Got it!
  set volume to 30 %
  play sound Humming
  wait 0.2 secs
  say 
  hide
  wait 0.3 secs
go to x: 0 y: 0
point in direction 90
switch costume to Monolith
go to front
go back 2 layers
show
say Stargate opened! for 2 secs
stop all
```

The image shows a Scratch script for a String sprite. It starts with a 'when clicked' block, followed by 'switch costume to String', 'hide', and 'wait 1 secs'. A 'repeat 7' loop contains a 'go to x: pick random 210 to -210 y: pick random 150 to -150' block, a 'show' block, and a 'repeat until touching Astro-Cat' loop. The inner loop has 'change y by 1', 'turn 5 degrees', 'wait 0.1 secs', 'change y by -1', 'turn 5 degrees', and 'wait 0.1 secs' blocks. After the loop, there are 'say Got it!', 'set volume to 30 %', 'play sound Humming', 'wait 0.2 secs', 'say', 'hide', and 'wait 0.3 secs' blocks. The script ends with 'go to x: 0 y: 0', 'point in direction 90', 'switch costume to Monolith', 'go to front', 'go back 2 layers', 'show', 'say Stargate opened! for 2 secs', and 'stop all'.

Now you're done!
Nice work!

2 STAGE



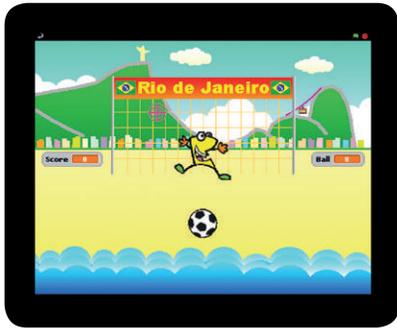
After saving the file, you can enjoy your final creation! Make the Stage full screen and click  to begin a new round.

Scratchy's Challenge!!

Add more lightning bolts to give yourself a challenge. Or you could replace the lightning bolt with a big, scary space monster you drew yourself! Give it a try!



THE ADVENTURE CONTINUES...



IT'S SUDDEN DEATH IN THIS PENALTY KICK SHOOTOUT!



DEFEND THE SERVER FROM SNEAKY HACKER ATTACKS!



GET THE GEM AND ESCAPE THE BOOBY-TRAPPED MAZE!



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