

## 1 Getting started with Scratch

Scratch is a graphical programming environment originally designed for use by children for creating narratives and games. Playing with Scratch will give you some experience building these types of applications.

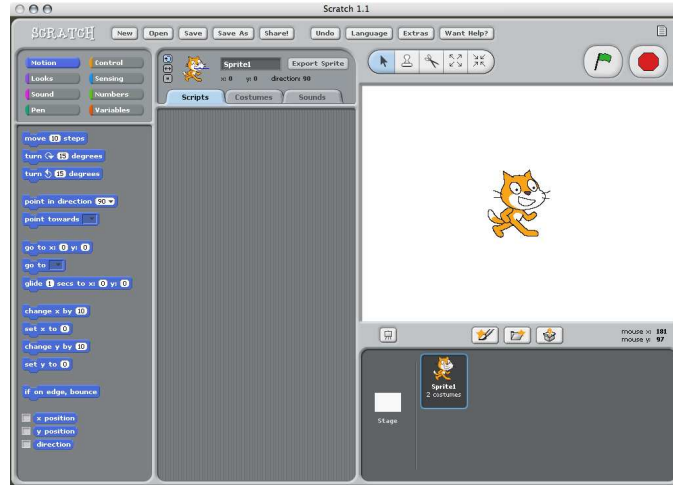
You will find that you can do many things with Scratch. This lab will give you a broad overview of its capabilities.

### 1.1 Start up Scratch

Double-click the **Scratch** icon, which looks like this:



The Scratch window looks like this:



### 1.2 Make something move

Find the blue block (in the left-most column) that says “move 10 steps” and **drag** it into the **Scripts** tab.




Then **double-click** on it. You should see the orange cat move to the right.

Try clicking on the **10** in the blue block (the one you dragged into the Scripts tab) and changing the value from **10** to **50**. Then double-click on it again. You should see the cat move further to the right.

### 1.3 Find the menu

Look for the Scratch menu in the upper left corner of the Scratch window. You'll see 8 different menu items. The default is **Motion**, which provides the set of blue blocks that appear in the left column when you start up Scratch. Click on the other menu items (**Looks**, **Sound**, **Pen**, **Control**, **Sensing**, **Numbers**, and **Variables**) to see what kinds of things Scratch has to offer. Some of these will be easy to understand without any explanation, while others will not. We'll go through some of them in this lab.





1.4 Click on the **Sound** menu item. Find the magenta block that says “play note 60 for 0.5 secs” and **drag** it into the **Scripts** tab.  Place it right underneath the blue “move [ ] steps” block. The two blocks should sort of click together. Now **double-click** on the group of both blocks. You should see the orange cat move to the right and hear a note play.

Try clicking on the **60** in the magenta “play note” block. You’ll see a list of note names. Each one is a different pitch. Try picking a value other than **60** and double-click on the blocks again. You should see the cat move again and hear a different note.


Try clicking on the **0.5** secs in the magenta “play note” block. You can edit this text to be another numeric value. A bigger value will make the note play for a longer time; a smaller value will make the note shorter. Try changing this value and see (hear) what happens. Remember, you have to double-click on the blocks every time you make a change in order to see the effects of your change(s).

Try adding more blocks from the **Motion** and **Sound** menus to make the cat move around in different ways. Try using the various blocks, such as “turn” and “set instrument”. See how funky you can get :-)

1.5 Click on the **Control** menu item. Find the yellow block that says “when [flag] clicked” and **drag** it onto the **Scripts** tab.  Place it at the top of the blocks you already have in the Scripts tag, so that you have one big group of blocks with the “when [flag] clicked” block on top.

Locate the green flag in the upper right corner of the Scratch window.  When you click on this flag, your program will run.

Try replacing the “when [flag] clicked” block with the “when [space] key pressed” block. Do this by deleting the “when [flag] clicked” block first. To **delete**, you need to move the blocks below the “when


[flag] clicked” block away from that block. Then find the **scissors** button.  Click on the scissors, then on the block you want to delete. You can click on the **Undo** button if you delete the wrong thing. Then drag the “when [space] key pressed” onto the Scripts tab and put it on top of your other blocks. When you press the space bar, your program will run.

You can change the key that your program responds to by clicking on the **space** in the yellow block and selecting a different key. Try using different keys to activate your program.

1.6 We talked about **looping** when learning Processing. In Scratch, you can also have loops that:  
 (a) repeat a fixed number of times, or  
 (b) repeat forever, or  
 (c) repeat if a condition is true, or  
 (d) repeat until a condition is false.



Try using one of the loop blocks by dragging it onto the Scripts tab and then drag the blocks you want


repeated inside the mouth (i.e., opening) of the loop block. 

- 1.7 Click on the **Sensing** menu item. This is where you can specify **conditions** that get inserted into the empty greyed hexagons in the “forever if”, “if”, “if-else”, “wait until” and “repeat until” blocks in the **Control** menu. Look again at my looping example and you’ll see the cyan block “key [f] pressed” inside the “forever if [ ]” block:




If you place this code in your Scripts tab and you press the **f** key, you’ll see your sprite move to the right as long as you hold down the **f** key.

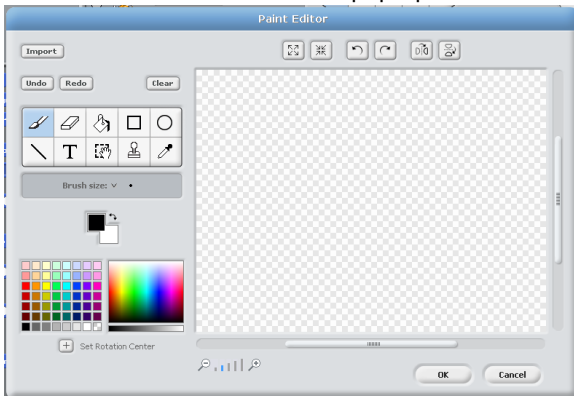
Try making a copy of this group of blocks and change the **f** key specifications to **b** and change the “repeat


**10 steps” to -10.** (The **copy button** looks like this: ) What happens when you press and hold down the **b** key?


- 1.8 Click on the **Looks** menu item. The blocks there can be used to change what the orange cat looks like. The cat is called a **sprite**. You can use the purple “Looks” blocks to change the sprite’s color, size and visual effects. You can also use the “Looks” blocks to pop up speech and thought bubbles next to the sprite.



- 1.9 You can create new sprites by clicking on the **Paint new sprite** button:  The **Paint Editor** window will pop up:



You can also load a new sprite from an image file by clicking on  (**Choose new sprite from file**)

or grab a surprise sprite from the Scratch library by clicking on  (**Get surprise sprite**).

- 1.10 Use the **Save** button to save your work!

## 2 Doing more advanced things

- 2.1 Try changing the background of the **Stage** (the thing that the sprites are moving around on). You can modify the Stage by clicking on the **Stage** button in the middle bottom region of the Scratch window



and you'll notice that next to the **Scripts** tab, there is now a tab called **Backgrounds**. There you can either create a new background using **Paint** or import an image file using **Import**.

- 2.2 Click on the **Pen** menu item. These blocks can be used to make your sprite draw lines on the Stage. Use the **pen down** block to begin drawing, followed by some **Motion** blocks to move the sprite around (and draw as it moves). Use the **pen up** block to make it stop drawing. The other **Pen** blocks can be used to change the color and thickness of the line drawn by your sprite.

## 3 Putting everything together

- 3.1 Try designing and implementing a small **narrative**—an animation that tells a story, or a **game**—an animation that responds to user input.
- 3.2 Include your own sprites by using the **Paint Editor** and by loading pictures from image files.
- 3.3 Be creative! Have fun!

## On-line references

### Scratch

- <http://scratch.mit.edu/> (scratch web site)