SCRATCH
KIDS CODING COURSE

VATE DIGITAL
TECHNOLOGIES

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STARTING SCRATCH

To start Scratch, click on ‘Start’ > ‘All Programs’ > ‘Scratch’ > ‘Scratch’ or follow the instructions given by your Lab Instructor for your lab.

BASIC INTERFACE

When Scratch starts up, you will see a screen similar to the one below. The different areas have been labeled for you and will be explained in more detail next.

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INTRODUCTION

Scratch is a simple environment designed by the Kindergarden Lifelong Learning Group at MIT to introduce some basic programming concepts in a fun and interactive manner. In Scratch, **sprites** (objects) are manipulated on the **stage** (background) using various **scripts** (small program segments). Each sprite has its own set of scripts to control its behaviors and how it interacts with other sprites and events. Programming consists of snapping together individual blocks of preexisting actions to create a script. A program can be as simple as a single block or consist of multiple blocks stacked together that will run as a unit.

SCRATCH


Scratch 1.2.1 (6-Dec-07)
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MENU: This is how you can create a 'New' project, 'Open' or 'Save' an existing project, 'Save (a new project) as' whatever name you choose, 'Undo' a previous action, and obtain 'Help'.

BLOCK DESCRIPTIONS: The block description area lists the eight categories of blocks including Motion, Looks, Sound, Pen, Control, Sensing, Numbers, and Variables. The block categories are all color coded so when you see a block of a specific color, you can quickly determine which category it came from.

BLOCKS PALETTE: This area shows all of the blocks available to you for use in your programming. Note that the blocks palette will change depending upon the current block category. When you select a new block category, the blocks palette will change to reflect the new options available.

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CURRENT SPRITE INFORMATION: Here you will find the name and picture of the current sprite together with its x-y position, direction, and rotation style.

TABS: These tabs allow you to both see and change the current sprite's **scripts**, **costumes**, and **sounds**. The scripts tab shows you any scripts that currently exist as well as to develop new scripts pertaining to the current sprite. The costumes tab allows you to create (from scratch or from a file), edit, or copy a costume. A costume is the visual image of the sprite on-screen. Sprites can have multiple costumes and use scripts to change between them. The sounds tab displays the current sprite's sounds.

SCRIPTS AREA: This is where you create and view the scripts pertaining to the current sprite.

STAGE: The stage is where all of the action takes place. The stage is 480 units wide by 360 units tall and the center of the stage is at x-y coordinate (0, 0). This means the lower left is at (-240, -180), the upper left is at (-240, 180), the upper right is at (240, 180), and the lower right at (240, -180).

TOOLBAR: A number of tools exist for your use. The arrow is the default selection and it allows you to pick up and move sprites and blocks of code around. There are also options for you to duplicate and delete items as well as grow and shrink your sprite.

GREEN FLAG / RED STOP: Typically you click on the Green Flag to start your main program(s) and the Red Stop sign to end them.

PRESENTATION MODE: This provides a full-screen view of the stage. To exit, use the 'Esc' key.

NEW SPRITE BUTTONS: Using these buttons, you can paint a new sprite, choose a new sprite from a file, or get a surprise (random) sprite.

SPRITE LIST: On the left, you will see a thumbnail for the stage. Clicking on this thumbnail changes the 'Current Sprite Information' area to reflect the properties of the stage. Stages can still have scripts and sounds. However, to change the appearance of the stage, you would select a different 'Background' as opposed to 'Costume'. On the right, you will see thumbnails of all of the sprites in the project together with the sprite's name, amount of costumes, and amount of scripts. You can easily change the current sprite by clicking on a different one. When you do this, the 'Current Sprite Information' area together with the 'Scripts area' are updated too

PART 1: LEARNING TO SCRATCH

The best way to learn Scratch is through experimentation. As it is an interactive environment, feel free to stop and experiment as you work through this tutorial.

WRITING SIMPLE SCRIPTS

To create a script, we simply drag a block from the Blocks Palette onto the Scripts Area. To run it, we can double-click it and observe what happens on the stage. Let's try…

At the moment, our current sprite is Sprite1 (the cat). By default, he is located in the center of the screen. You can drag him anywhere on screen that you wish at any time.

Basic movement: Let's make him move 10 steps forward by selecting 

from the Blocks Palette and dragging it onto the Scripts Area. When you double-click the block, you should observe the cat move 10 steps to the right. You can double click the block as many times as you wish. The cat will continue to move.

Editing a text field: You can edit the white text field portion of the block by clicking on the '10' and changing it to another number like '-10'. Double click it and see what happens. Now change it to '100' and observe the difference.

Help: To find out what a block of code does, simply right-click on the block and select 'Help' from the pop-up menu. Give it a try!

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EXPANDING A SCRIPT

To expand the script, simply snap a second block to the first. Scripts are executed from the top to the bottom so you need to add the block accordingly. If you want the new block to execute first, add it on top of the existing block. Otherwise, add it below. As you drag a block into the Scripts Area, a white line will indicate where you can properly join the new block with the existing script structure. When you are ready, you can double click anywhere on the new script to execute it.

Turning: Snap a 

block underneath the current block. Try changing the '15' to '90'. If you run this new script a few times, you can see your sprite moving around. And that's just the beginning!

REARRANGING A SCRIPT

To move a stack of blocks around, select the top block first and then drag it where you wish. To split a stack, click on a block within the stack and pull it out. All blocks underneath it will come too. You can continue to split the stack and move blocks around to create a new script. Alternately, you can right-click on a block and 'delete' it if it is no longer useful or you can choose to 'duplicate' it if you want an extra copy. As well, 'Undo' can be found in the Menu along the top if you need it.

Duplicating: Right-click on your current script and duplicate it three times so you have a total of four copies. You may need to move blocks around. When finished, your script should look like **Figure 1a**. Try it!

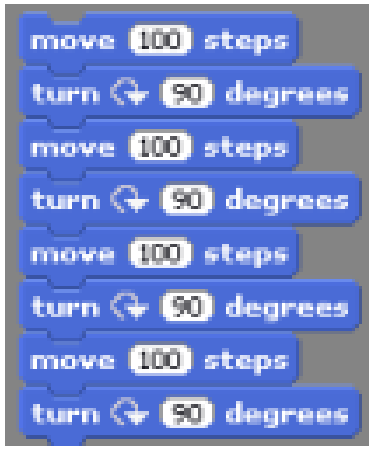


Figure 1a

Note: If it doesn't seem like Sprite1 is really moving or the movement is only a flash, you can click on the Control category and add in some wait 1 secs blocks to pause after movements as appropriate.

Repeating: Instead of explicitly writing the steps four times, let's use a loop instead. From the Control category, drag the repeat 10 block into the scripts area and change it to repeat only 4 times. Then move one pair of the move / turn blocks INSIDE of the repeat block and add a wait 1 secs so it looks like **Figure 1b**. This way, you use fewer blocks to perform the same task.

Figure 1b

Deleting: Right-click on your **Figure 1a** script and delete it.

RUNNING MULTIPLE SCRIPTS

It is typical for each sprite to have multiple scripts giving it access to a range of behaviors. Each script will be in the Scripts Area and can be run by double-clicking.

Reposition: Make a new script by dragging the go to x: 0 y: 0 block into the Scripts Area. When you run the new script, the sprite will reposition itself in the center of the screen. You can practice moving to other locations by changing the text field numbers.

PART 2: HAVING FUN WITH SCRATCH

Now that you have some of the basics, it's time to start exploring some of what you can do in Scratch. Select 'New' from the Menu to start a new project.

CHANGING THE BACKGROUND

1. Select the **Stage** thumbnail from the Sprite List.

2. Now choose **Backgrounds** from the Tabs area. You should see something similar to **Figure 2**.

   You can either Paint a background yourself, Import a background from a file, Edit an existing background, or Copy a background (useful to do before editing).

Figure 2a

3. Select **Import** and find a background you like in one of the existing files (such as 'Outdoors' > 'brick-wall1'). Click 'OK' when ready.

4. Since you no longer need 'background1', you can click on the ⊗ to delete it. You should now have an interesting background!

Sprite manipulation: Main Sprite

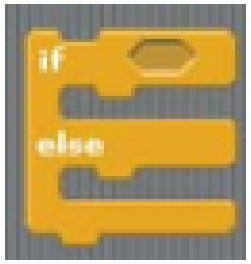
There are three options for introducing a new sprite:
(1) Design one yourself using the Paint option within Scratch, (2) Open up a pre-existing one from a file, or (3) let Scratch pick a random sprite for you.

Sprite manipulation: Secondary Sprite

We can now take our dog for a walk. Let's give him something to play with …

Making a new sprite: Select the 'Choose new sprite from file' option from the New Sprite Buttons area. Choose 'Things' > 'basketball' to obtain a basketball.

CONDITIONAL DECISION MAKING STATEMENTS



In order to make a decision about what should be done, we need to use an **if-else statement**. If some Boolean condition (true or false question) is true, then we need to take a specific course; otherwise, we need to take an alternative course of action. To form a Boolean condition, we can choose from the existing Boolean conditions (such as 

or 

from the 

category) or create a new one (using a template such as 

from the 

category). Notice that these blocks have pointed ends and will only fit inside other blocks whose shape matches their own.

SPRITE INTERACTION

In order for our sprites to interact, we need a means through which they can communicate. This typically involves touching. When one sprite touches another, an event occurs. We can capture this using a 

block to send a message and a 

block to receive the message. The message sent can be named whatever you wish. The only requirement is that the message sent and received must be identical.

Broadcasting: Make Sprite1 (our dog) the current sprite by clicking on its thumbnail in the Sprite List. When we happen to touch the ball, we want to send a message indicating that we're touching the ball. Since our dog gets excited when this happens, he'll say "Woof!". Modify the initial script from **Figure 2b** into **Figure 2f**. Test it and see what happens.

VISUAL ENHANCEMENT

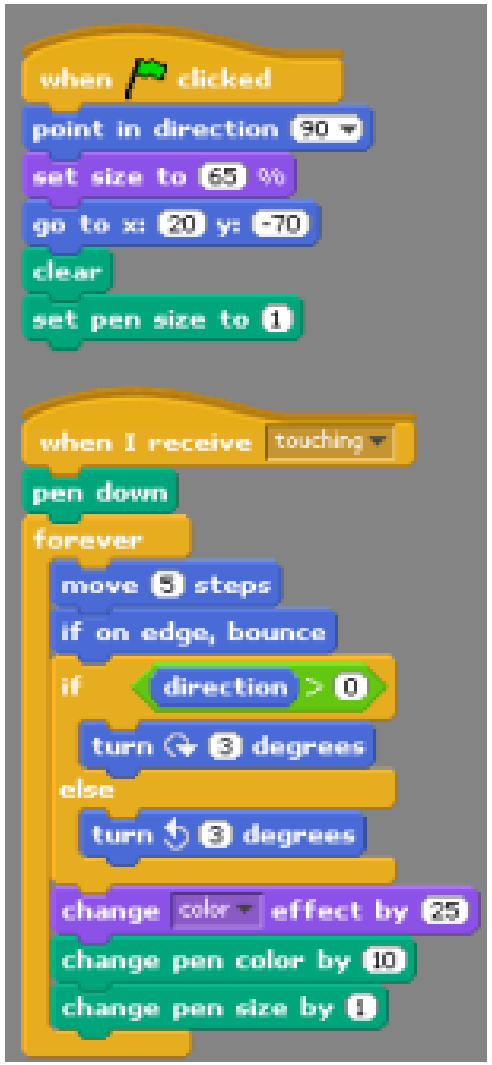
There are lots of creative ways to visually enhance the scene. We can have the ball change colors or leave a trail as it bounces. We can make this trail change colors or even size. **Figure 2i** illustrates for you how to accomplish these outcomes.

Try experimenting with some of the drop down menus for different effects. For example, you could try "whirl" in place of "color" in the block 

. You could also add 

from the 

category (although this may not work on all computers). Use your imagination!



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