Today you will learn to program using MIT's Scratch platform. We will walk them through creating their own applications. The core concepts that will be taught are: events, operators & math, and conditional logic. To teach these concepts, you will write your own application.

**Getting Started - Installing Scratch**

If you have not already installed Scratch, we have provided USB drives with the software. The USB drives include **Scratch 2** and **Adobe Air** for Windows, Mac OS X, and Linux. Unfortunately, Adobe has stopped support for Air on Linux. They offer documentation on installing for Linux on their website (<https://helpx.adobe.com/air/kb/install-32-bit-air-linux.html> & <https://helpx.adobe.com/air/kb/install-air-2-64-bit.html>).

* *Windows users*: Install *“AdobeAirInstaller.exe”.* Upon completion, install Scratch-432.exe
* *OS X users*: Mount and Install *“AdobeAIR.dmg”*. Upon completion, mount and install Scratch-432.dmg

**What you will know how to do after this class:**

* Learn to program using **MIT's** [**Scratch**](http://scratch.mit.edu/scratch2download/)
* **Events**: you will write a hello world application.
* **Logic**: you will write a decision making game.
* **Operators and Math**: you will write a Point of Sale system.
* Finally, will close the class with resources and where to go next.

**ASSIGNMENT 1**

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| Screen Shot 2015-02-18 at 6.48.01 PM.png | Welcome to Scratch!  Sprites:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Events:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-18 at 6.48.27 PM.png | Start Flag:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Stop Flag:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-18 at 6.48.42 PM.png | Time Flag:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-18 at 6.48.57 PM.png | Looks:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Say:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-18 at 6.49.54 PM.png | Text Changes:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-22 at 5.02.23 PM.png | PLAY! |

ASSIGNMENT 2

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| Screen Shot 2015-02-22 at 5.39.20 PM.png | Now lets add 5 more sprites!  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-22 at 5.39.35 PM.png |  |
| Screen Shot 2015-02-22 at 5.40.58 PM.png | Pick a sprite!  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-22 at 5.44.52 PM.png | Take one sprite, and lets get going! |
| Screen Shot 2015-02-22 at 6.20.58 PM.png | Conditionals (if)  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-22 at 6.21.16 PM.png | ACTION!  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Screen Shot 2015-02-22 at 6.33.55 PM.png | Now, lets make things a little more complicated.  Give the dinosaur a little more to do! |
| Screen Shot 2015-02-22 at 6.41.18 PM.png | if/else:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**ASSIGNMENT 3**

For your final assignment, you will create a point of sale system that could be used. We’re going to create one for your favourite snack shop! Our primary goal is to teach you how to use various mathematical operators and to add some math to your application. However, you will also learn to identify user interface elements, how to prototype a user interface using those elements, and how to make it all work together.

First, we need to identify what we’re selling. Our snack shop sells the following **fruits**: **apples** ($1.90), **bananas** ($2.15), **oranges** ($1.00), and **watermelons** ($3.25).

Finally, when the order is entered in, you must be able to **complete** it and ring it up or **cancel it** at any point in time and reset the point of sale system. When an order is completed, we must **add** *9.75%* tax to it.

**Activity:**

We will define our user interface elements.

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| **ACTIONS**  Define each different action type that our application will need. | **DIFFERENT TYPES OF ACTIONS**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **USER INTERFACE ELEMENTS**  Define the types of user interface elements we will need. Each action should have a unique element. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **INTERFACE ELEMENT ACTIONS**  Define the actions for each user interface element.  **Elements:**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **Actions:**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **CREATE A PROTOTYPE INTERFACE** | Below, define our user elements. To keep our interface organized, we will have our user interface split into two portions: *Order buttons* and *order action buttons*. |
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**Activity:**

Now, we will design the application in Scratch.

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|  | You will create a new application in Scratch. We’re going to now add some custom sprites to our application. In the Scratch IDE, select  from the IDE menu. You will now see the Sprites Library. |
|  | Select **Things** from the Library menu. We’re going to add our two action elements: a **checkbox** and a **cancel “x”**. The checkbox will be used to complete orders and the cancel will be used to reset orders. |
|  | Place these elements on your application next to each other. |
|  | Now, let us add our items for sale: apples, bananas, oranges, watermelons, muffins, and cake. *Tip:* You can find all of these items in the “Things” sprite library. |
|  | Now, we need a global **variable**. These are data types that we can use and modify through programming. We’ll use the **Data** menu to create these. We will create two: “Total Price” and “Price with Tax”. |
|  | To start letting out application run, we need to create a new event tied to the **green flag** (run) button. Select the “**Stage**” and then open “**Events**” to create our starting event. |
|  | When it is clicked, we want to set our **variables** to 0. |
|  | Now, we need to modify the **total price** whenever an item for sale is clicked. Select the apple. When this sprite is clicked, we need to add the cost of the apple to the total price. We will then use the **operators** menu to add the cost to the total price inside of a set statement. Remember that Apples cost **$1.90**. |
|  | You will need to repeat this step for each of the other three items. Prices are as follows: **bananas** ($2.15), **oranges** ($1.00), and **watermelons** ($3.25). |
|  | Now, we need to make sure our cancel button clears out any order. We will create an event that when it is clicked it will set both of our variables to 0. |
|  | Finally, we will give our “Checkout” button the ability to calculate tax. We will do that by using the formula **sales tax = total price \* tax rate**. We will then add our total to that price. Using order of operations, we can construct our math to be:  Total with Tax = Total Price + (Total Price \* Sales Tax)  We just need to use two math operators nested inside of each other to achieve this. |
|  | And that is it! Hit “Run” and test your application out. Congrats; you have created your first fully functional application. |

**Next Steps:**

Now that you have learned the fundamentals of programming, we recommend reading more about the concepts taught today. While different platforms will use a variety of programming languages, the fundamentals are the same. Below are some great reads for the novice programmer:

**The Little Introduction to Programming** - <http://codingintro.com/chapter/en/1/introduction>

**Try Git** (a popular source control application) - <https://try.github.io/levels/1/challenges/1>

**Khan Academy’s** Intro to Programming course - <https://www.khanacademy.org/computing/computer-programming>

**Code Academy** offers a great selection of free tutorials and classes that teach various programming languages - <http://www.codecademy.com/>

**Coursera** offers a plethora of free, online courses from acclaimed universities - <https://www.coursera.org/>

EdX uses a platform similar to Coursera’s and offers a variety of classes from recognized universities for free. <https://www.edx.org/>

If you want to get a head start on next week’s programming class, check out the Learn Java Course (free): http://www.learnjavaonline.org/

EdX is offering an intro to Java programming course starting April 15th this year for free: https://www.edx.org/course/introduction-programming-java-part-1-uc3mx-it-1-1x#.VO1JlPnF98E

Once you have the basics covered, think about what you’d like to do with programming. Do you want to make websites? You should look into front end development. Do you want to write apps for iOS or Android? You will need to look into those platforms. You will find countless of free online resources available. If you have any questions or would like further advice or guidance, do not hesitate to contact us! You can find our contact information on our website at <https://pie-coding.github.io/>