

WEEK 3:

**Intro to Programming
with Scratch**

Welcome to the 2021 Summer STEM Program!

We are so excited to have you! A few rules:

- 1) We would really appreciate if you all had your cameras on! It really helps us guide you through the workshops!
- 2) Please ask any questions you may have during the process! These are challenging workshops with complex concepts so it is completely normal to run into problems or questions. Asking questions and fixing errors is all part of the experimental process!

Programming Introduction

```
(key)) tempString = tempString.replace(
    (value*pow(10,14-tmpFormat))) tempString =
    (typeOfID == "BUFFER"): s = value dataCal
    tempString.replace("czFieldID",str(key)) temp
    (typeOfID == "ASCII_STRING"): s = value d
    ) tempString = tempString.replace("czDa
    if "name value=" in line and flagCheckRi
    if "</Message>" in line: myEvent = "RT
    -onlyfilename+"\n" if typeOfFile
    if not os.path.exists(
```

What is programming??

When you are programming, you are telling a computer to perform tasks. Computers are quite intelligent, but they can not understand English very well.

That is why you have to speak to them using a **computer language**.



Binary

You might have seen binary before. Binary is what a computer understands. It is a **number system** made up of 0s and 1s.

However, coding in binary is very confusing! Imagine trying to tell a computer to do something if you can only talk to it in 0s and 1s!



This is what binary looks like.

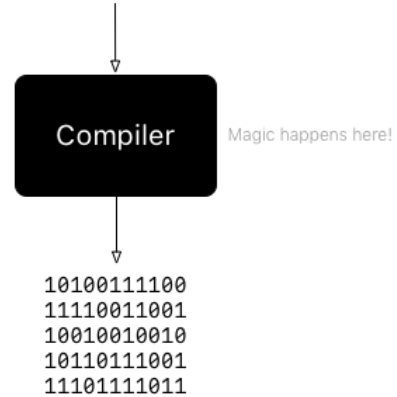
Compiling

Fortunately, computer programmers don't need to talk to a computer in binary.

Instead, we made languages that can enable us to easily communicate with computers. These languages are able to be translated into binary through what we call a **compiler** (translates something we can understand into something the computer can understand).

What normal code looks like. A lot more simple!

```
func greet() = {  
    Console.println("Hello, World!")  
}
```



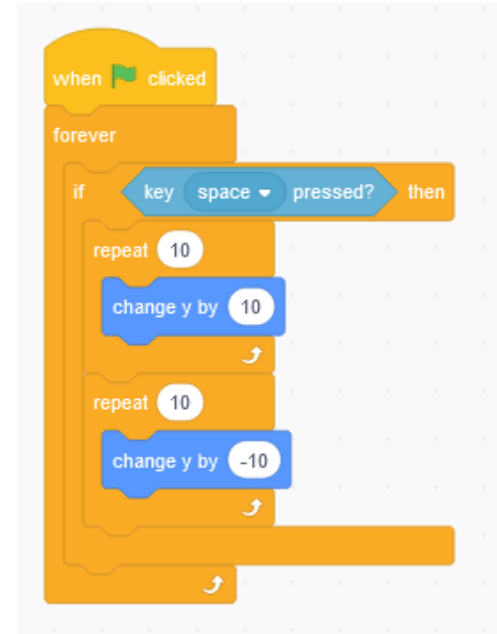


Scratch Introduction

What is Scratch?

Scratch is a website (scratch.mit.edu) that lets you program using simple blocks! Just like any other coding language, the Scratch language gets translated into binary.

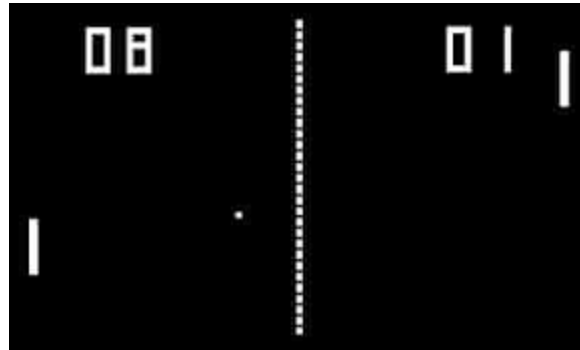
A sample of Scratch code.



PONG GAME INTRODUCTION

What is Pong?

Pong is a game where
a ball bounces
between paddles



We will be making
Pong in Scratch!

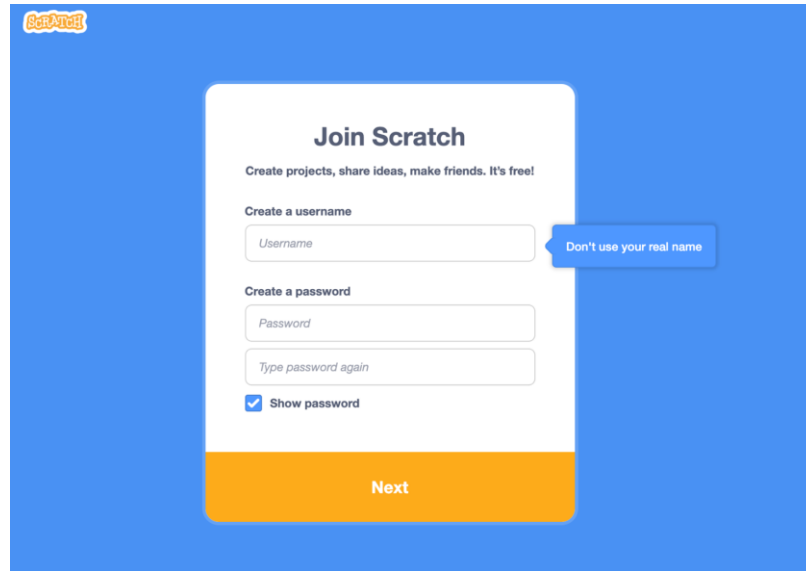
PONG GAME INTRODUCTION

Students will learn the fundamentals of coding. Using blocks of code, they will develop a fun Pong game. In this game, they will play the traditional Pong game against an AI paddle and collect points when the ball hits diamonds on the playing field. Additional customization can be added after the workshop. Here is a link to the game: <https://scratch.mit.edu/projects/546947046>

When the ball hits the crystal, the player will gain 3 points. When the AI paddle fails to hit the ball and the ball hits the upper red line, the player will gain 1 point. If the ball hits the lower red line, the game is over. Players try to earn as many points possible before they miss a turn.

Making an Account

Scratch website:
<https://scratch.mit.edu/join>



The image shows a screenshot of the Scratch website's registration page. The page has a blue background with a white central form. At the top left of the form is the Scratch logo. The title of the form is "Join Scratch". Below the title is the text "Create projects, share ideas, make friends. It's free!". The form is divided into two main sections: "Create a username" and "Create a password". The "Create a username" section has a text input field with the placeholder "Username" and a blue callout box pointing to it that says "Don't use your real name". The "Create a password" section has two text input fields: the first with the placeholder "Password" and the second with the placeholder "Type password again". Below these fields is a checkbox labeled "Show password" which is checked. At the bottom of the form is a large orange button labeled "Next".

Scratch

Join Scratch

Create projects, share ideas, make friends. It's free!

Create a username

Don't use your real name

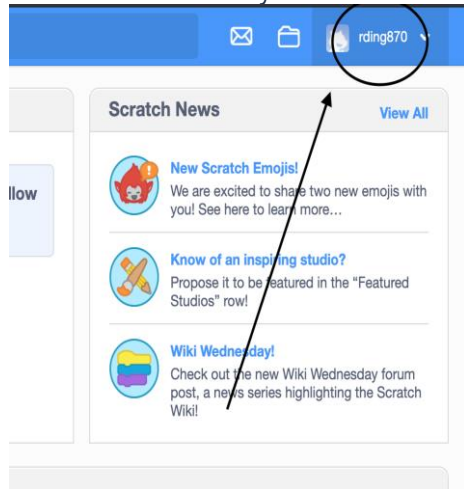
Create a password

Show password

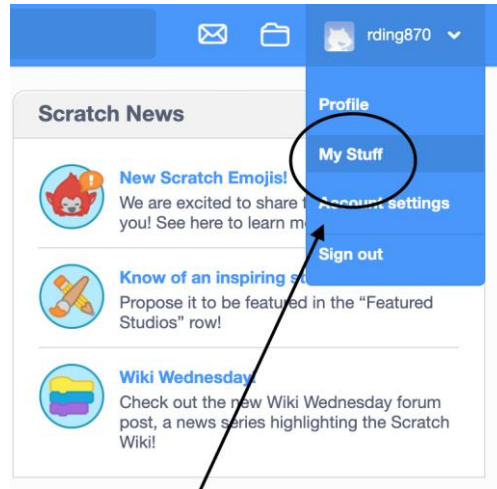
Next

Starting a New Project

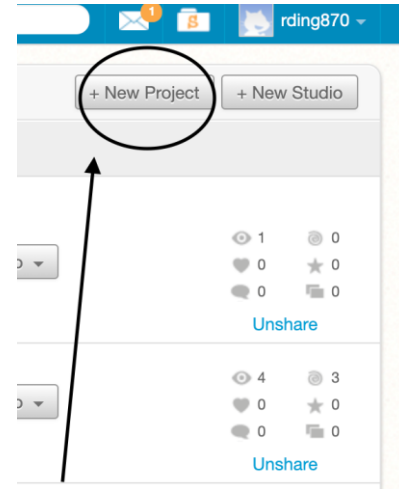
1. Click your username on the upper right corner of your screen.



2. Click "My Stuff" in the drop down.



3. Click "New Project"

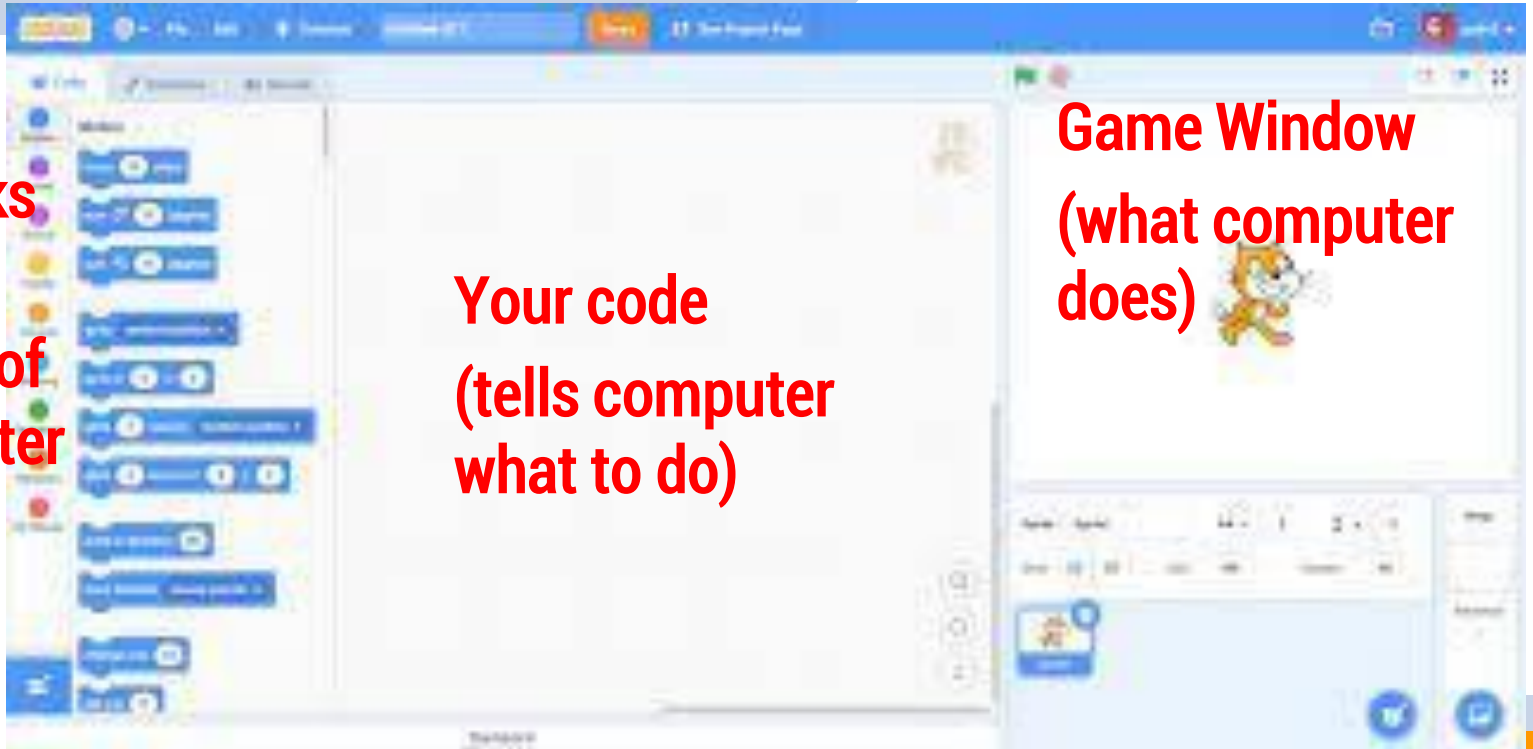


Scratch Work Environment

Code blocks
(imagine a
dictionary of
the computer
language)

Your code
(tells computer
what to do)

Game Window
(what computer
does)



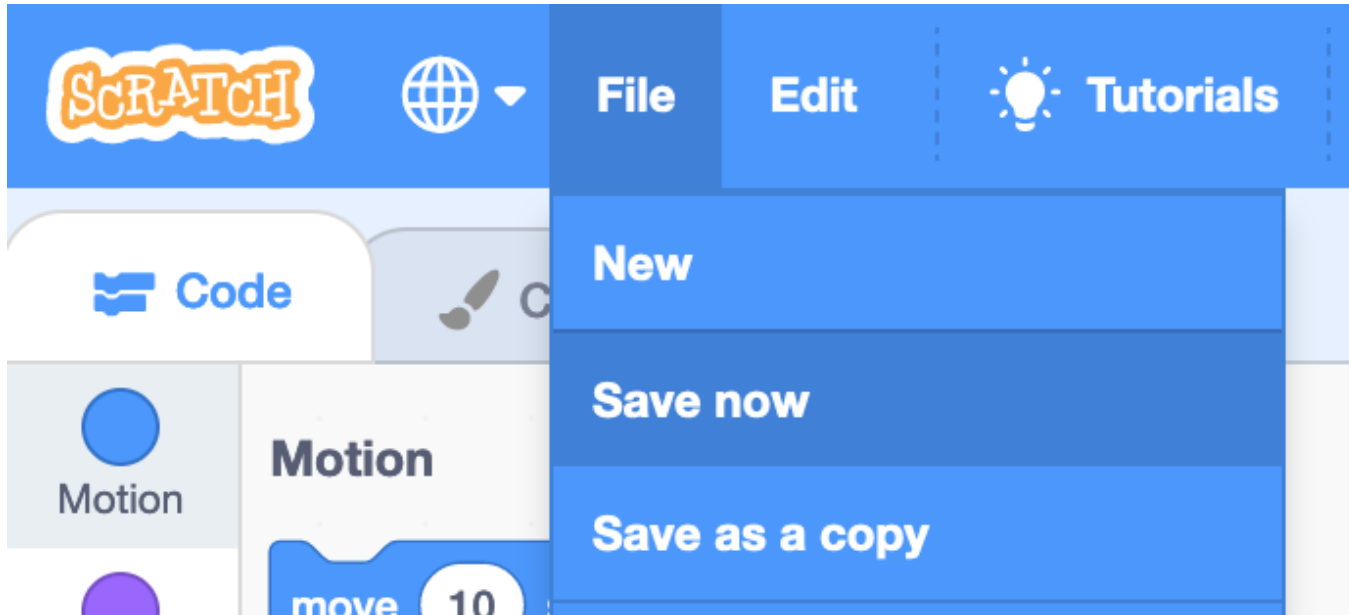
Adding sprites and background

4. Add the sprites needed:

The screenshot shows a game development interface with the following elements:

- Sprite Settings:**
 - Sprite: **Ball**
 - x: **155**
 - y: **-77**
 - Show: (eye icon) (eye with slash icon)
 - Size: **60**
 - Direction: **135**
- Sprite Palette:**
 - Ball**: An orange sphere with a trash icon.
 - Paddle**: A green horizontal bar.
 - Line**: A red horizontal line.
 - AI Paddle**: A green horizontal bar.
 - AI Line**: A red horizontal line.
 - Crystal**: A blue diamond.
- Stage and Backdrops:**
 - Stage**: A blue perspective view of a stage.
 - Backdrops**: A list containing the number **3**.

Save your Project!



Code for Ball Sprite

```
when green flag clicked
  set score to 0
  go to x: 0 y: 0
  point in direction 45
  forever
    move 15 steps
    if on edge, bounce
```



```
when green flag clicked
  forever
    if touching Paddle ? then
      point in direction pick random 50 to -50
    if touching AI Paddle ? then
      point in direction pick random 130 to 230
```


Code for Player controlled paddle

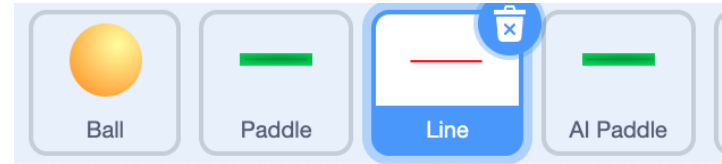
The image displays the Scratch development environment. On the left, the code editor shows a script for a paddle's movement:

```
when green flag clicked
  forever loop
    set x to mouse x
```

On the right, a preview of the game is shown. The game features a blue grid background with a red paddle at the bottom and a blue ball in the center. A score counter at the top left shows a score of 0. The paddle is controlled by the mouse, as indicated by the code. The game interface includes a 'Sprite' panel with 'Paddle' selected, and a 'Ball' sprite is also visible in the panel.

Code for Bottom Line

```
when clicked
  forever
    if touching Ball ? then
      stop all
```



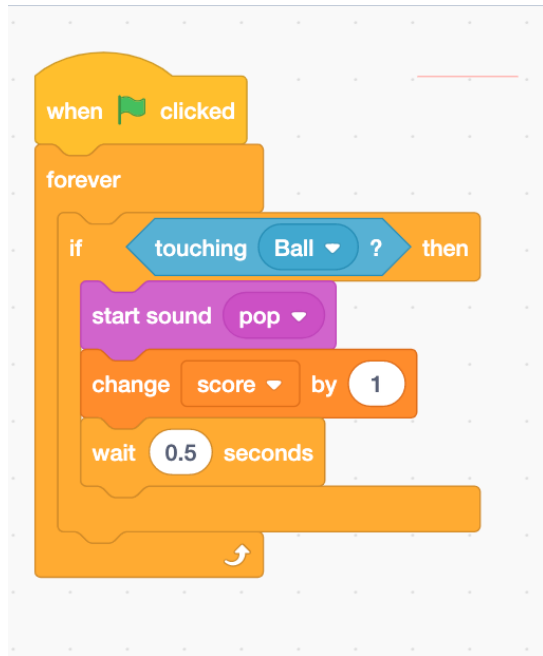
Code for computer controlled paddle

The image displays the Scratch code for a computer-controlled paddle in a game. The code is as follows:

```
when green flag clicked
  set x to 0
  forever loop
    if (x position of Ball - 5 > x position) then
      change x by 6
    if (x position of Ball + 5 < x position) then
      change x by -6
```

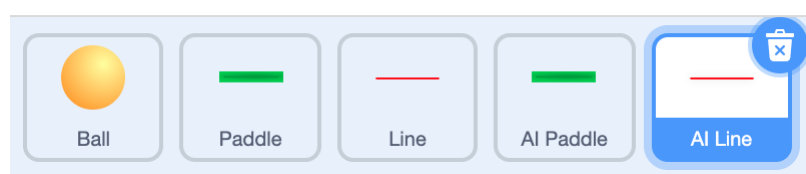
The game preview on the right shows a blue rectangular arena with a black floor and walls. A green paddle is positioned at the bottom center. A yellow ball is on the right side. A score display at the top left shows 'score 0'. The AI Paddle sprite is selected in the bottom right panel, with its x-coordinate set to -114.

Code for red line on the opposing side

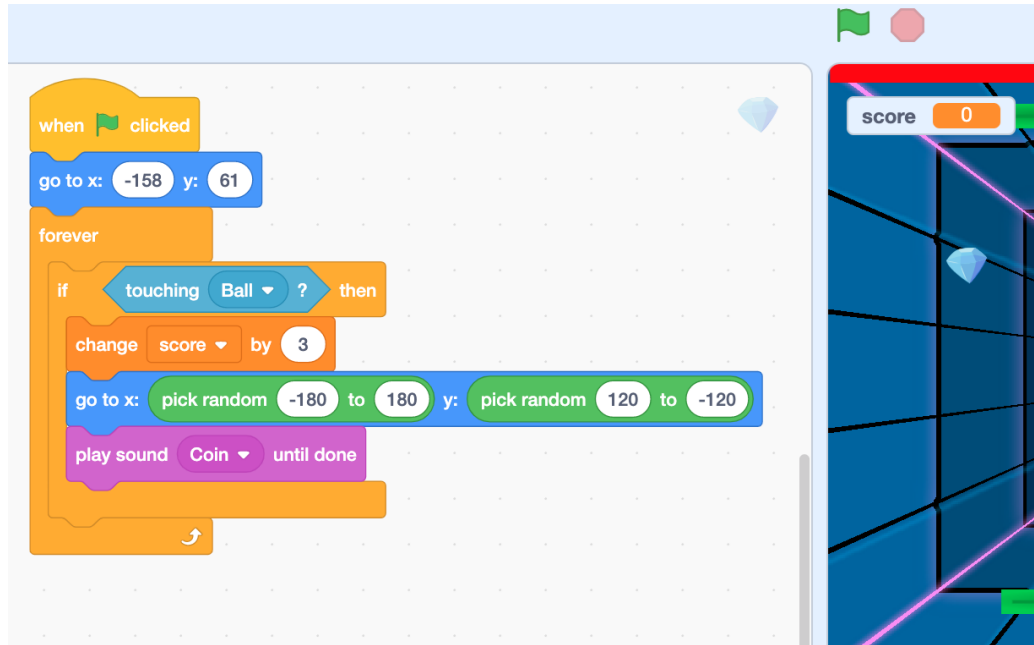


```
when green flag clicked
  forever loop
    if touching Ball ? then
      start sound pop
      change score by 1
      wait 0.5 seconds
```

The image shows a Scratch script on a grid background. It starts with a yellow 'when green flag clicked' block. Below it is an orange 'forever' loop block. Inside the loop is an orange 'if touching Ball ? then' block. The 'if' block contains three stacked blocks: a purple 'start sound pop' block, an orange 'change score by 1' block, and an orange 'wait 0.5 seconds' block. A red horizontal line is visible in the top right corner of the grid.



Code for crystal



The image displays a Scratch script and a corresponding game preview. The script is as follows:

```
when green flag clicked
  go to x: -158 y: 61
  forever loop
    if touching Ball ? then
      change score by 3
      go to x: pick random -180 to 180 y: pick random 120 to -120
      play sound Coin until done
```

The game preview on the right shows a blue grid background with a diamond icon (the crystal) and a score display at the top showing a score of 0. A green flag is visible in the top right corner of the game area.