STEM N Schools

A Teacher's Guide To

Scratch

Jacquelyn Thomas

I have been using Scratch since its inception in 2007 to guide students through this dynamic programming platform. As a Computer Scientist and Educator, I believe that technology plays a vital role in education.

The skills of critical thinking, creativity, communication, and collaboration are essential for students to thrive in our rapidly advancing digital landscape. Scratch, with its intuitive interface and limitless potential, is the perfect platform for students to develop these skills.

In my years of teaching, I have learned a great deal from my students. I have seen how Scratch can help students to think critically and creatively, and to collaborate with others. I have also seen how Scratch can be used to bring students' imaginations to life in the form of interactive stories, games, and animations.

I created this guide book to make it easy and convenient for teachers to assist students with their visual programming projects .

This guide provides a brief overview of Scratch and its interface, as well as a reference for each of the blocks and functions.

I hope that this guide will help teachers to get started with Scratch and to use it to its fullest potential.

Jacquelyn T. Smith

Project Description

Scratch is a visual programming language that allows beginners of all ages to learn how to code and create interactive stories, games, and animations.

To use Scratch, you will need to create an account on the Scratch website and choose a sprite. Then, you can add blocks of code to the script area to control the behavior of your sprite.

There are many different blocks of code available, so you can create a variety of projects. You can also use the Scratch community to find help and inspiration.

What is Scratch coding?

Scratch is a visual programming language that uses blocks of code that you drag and drop to make your own projects. It's like assembling a puzzle.
To download Scratch, click here: [Download Scratch](#)
To use Scratch online, click here: [Scratch website](#)

Scratch is beginner friendly

Scratch is a user-friendly platform that teaches programming concepts interactively and enjoyable. It's widely used by students to create games, animations, and stories. With built-in extensions like text-to-speech and video sensing, Scratch enhances project interactivity. It's an ideal starting point for students learn coding and programming fundamentals, even if they have no prior experience.

Scratch is easy to learn

Scratch coding is very easy to learn. It's perfect for kids who want to start their journey into programming. Scratch interface is designed keeping students in mind, making learning to code fun and interactive.
Scratch is suitable for all grade levels
Scratch coding is suitable for students who want to get introduced to programming. Scratch is designed for students of ages 8-16, however.

Scratch is safe

Scratch is a completely safe platform. Students projects are made public only if they choose to, or they can set their project visibility to private.

Lets Get Started!

How to sign up on Scratch?

1.Navigate to <u>Scratch website</u> on any browser

2.Click on Join Scratch.

3.Create a username and password.

4.Select your Country

5.Select your birth month and year.

6.Select your gender.

7.Finally, enter your email address to create your account.

After creating account, verify email by logging into email account and clicking the confirmation link in the email from Scratch.

·Check Spam or Junk folder if you don't see it in your inbox.

Verification is crucial for project sharing, with the Scratch community, friends, family, and teachers. Keep in mind that without an account, students can't save or share their projects, therefore creating an account ensures all projects are accessible online.

Introduction to Scratch interface

Let's explore the Scratch interface! Scratch interface is the area where you can create your Scratch projects.
 To create a project on Scratch, click on Create.
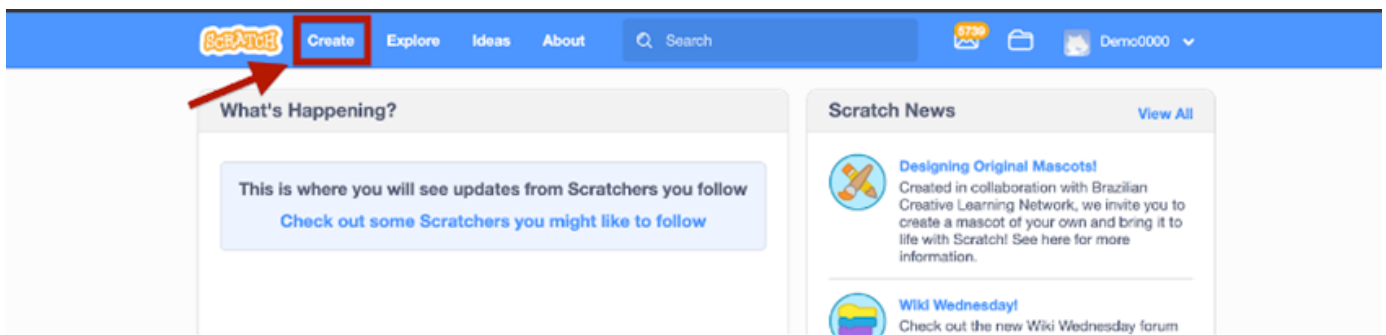
Scratch interface is divided into 4 major parts.

1. Programming palette
2. Sprite
3. Stage
4. Script area
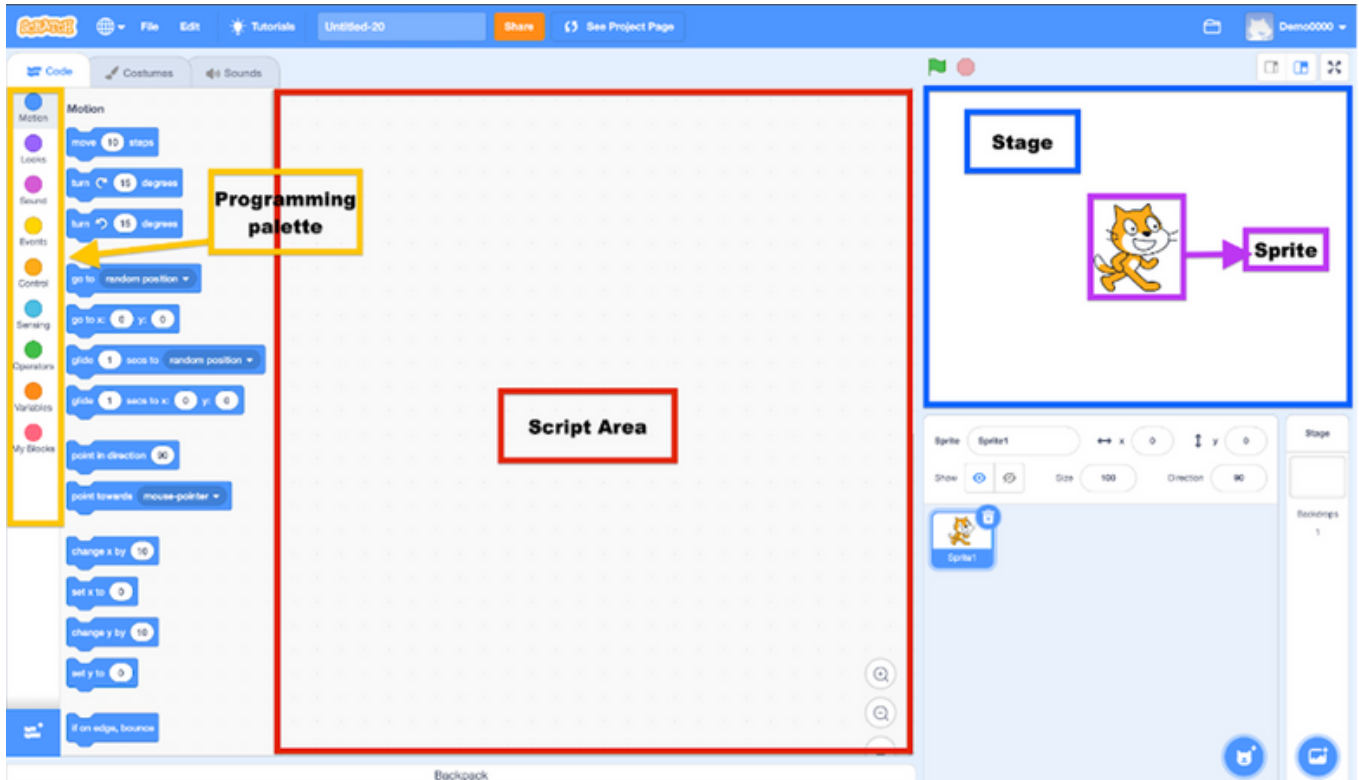
Programming palette
It contains all the Scratch programming instructions in the form of blocks. These blocks fit together vertically like pieces of a puzzle.
As every block has a unique shape it prevents syntax errors. These connected blocks are then called scripts.

Sprite

Sprites are the characters or objects of the program. They can be the main character, enemies, objects or obstacles of your game.
You can program a sprite using the programming palette. The sprites are the target of all the actions performed in Scratch programming. By default, the sprite is a cat avatar.

You can also select sprites from the sprite library. Click on choose a sprite on the bottom left corner.
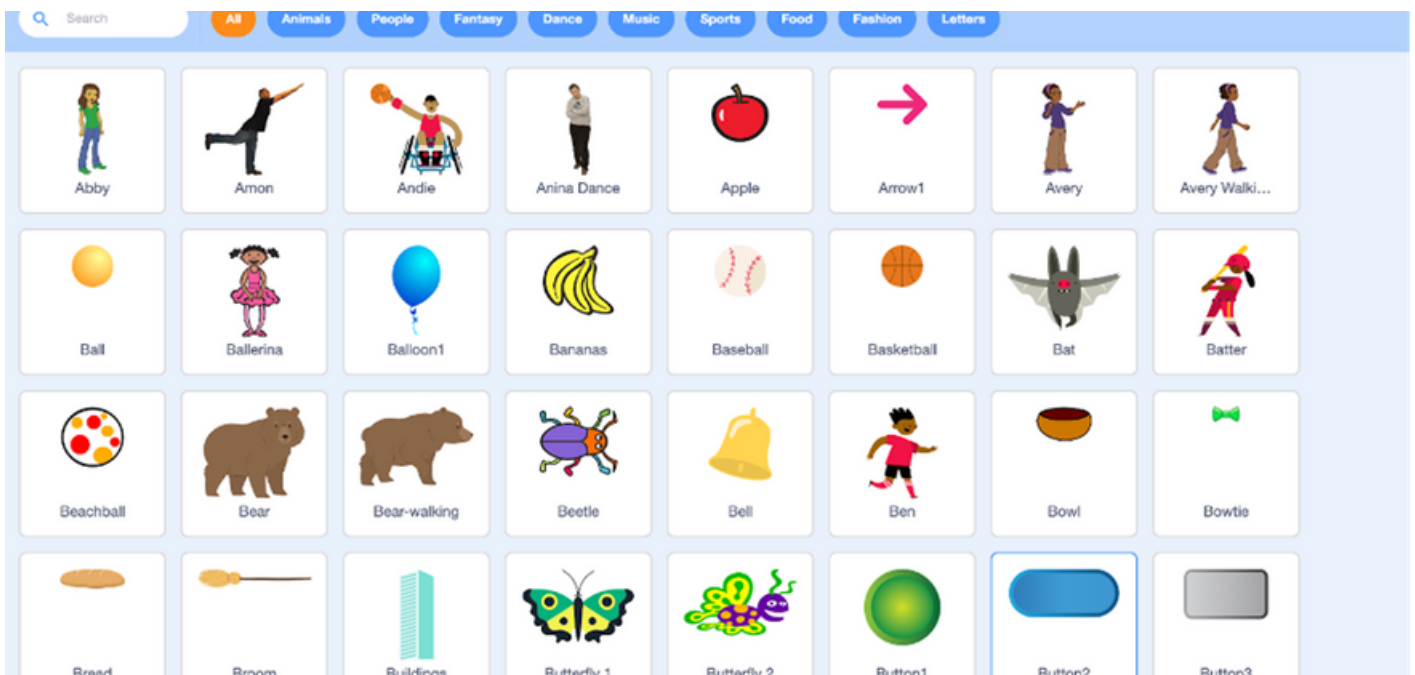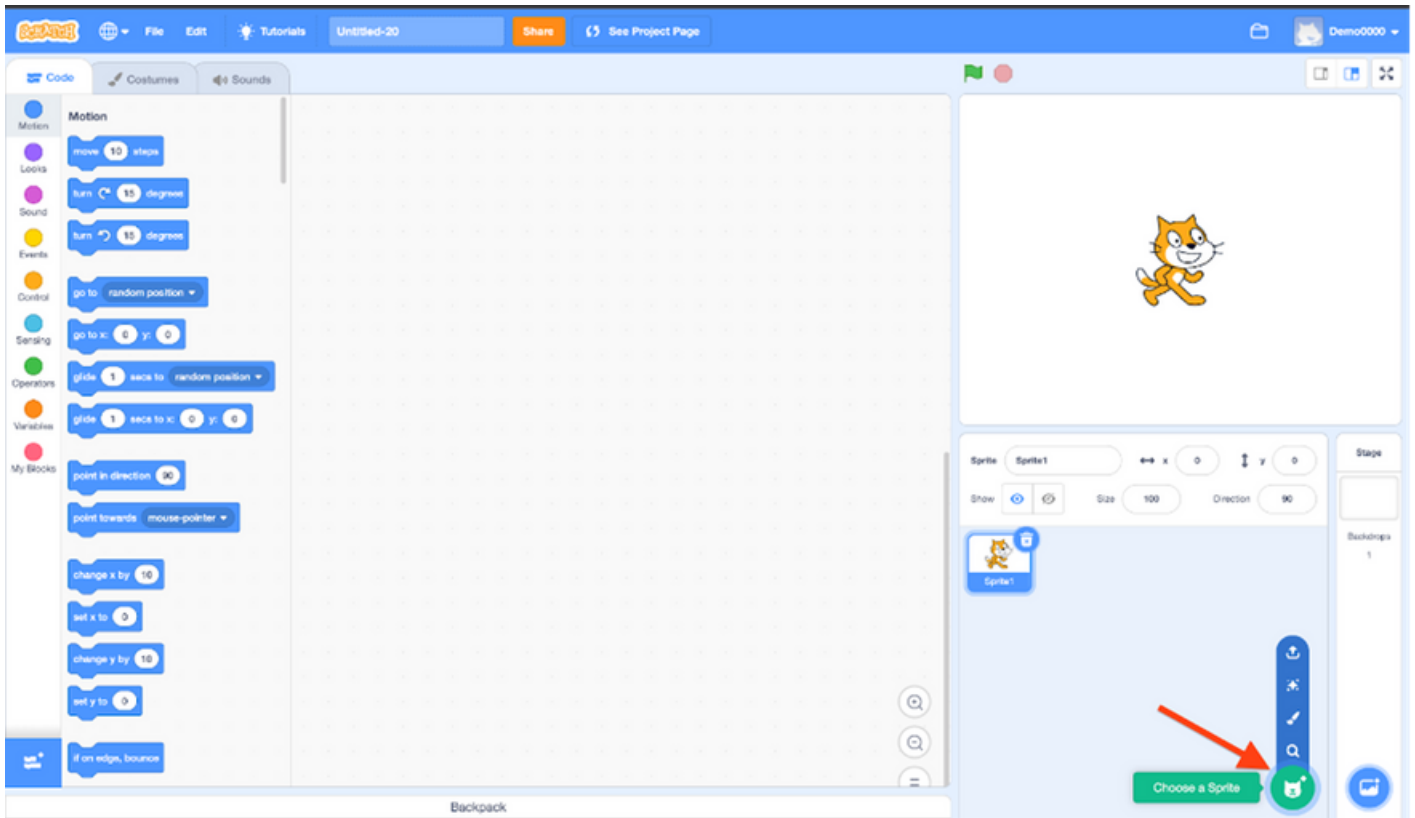
Scratch also gives you an option to paint your own sprite or upload any external sprite. To delete a sprite, click on the dustbin icon present on top of the sprite.
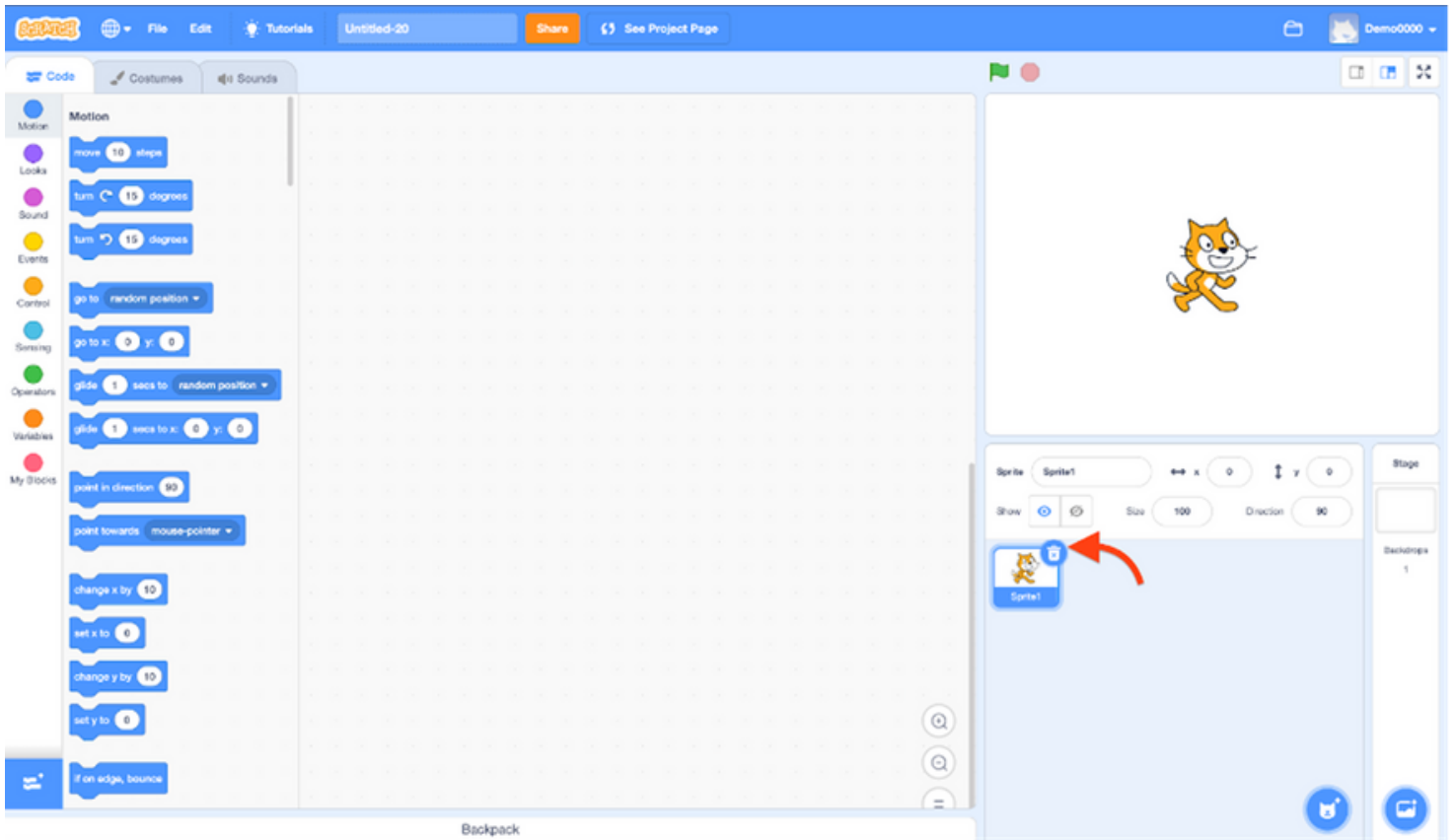
Stage Area

Stage area is where the action happens. Sprites appear, disappear, move, interact as they follow the scripts. You can also go into full screen by clicking on the Full screen control on the top right corner.
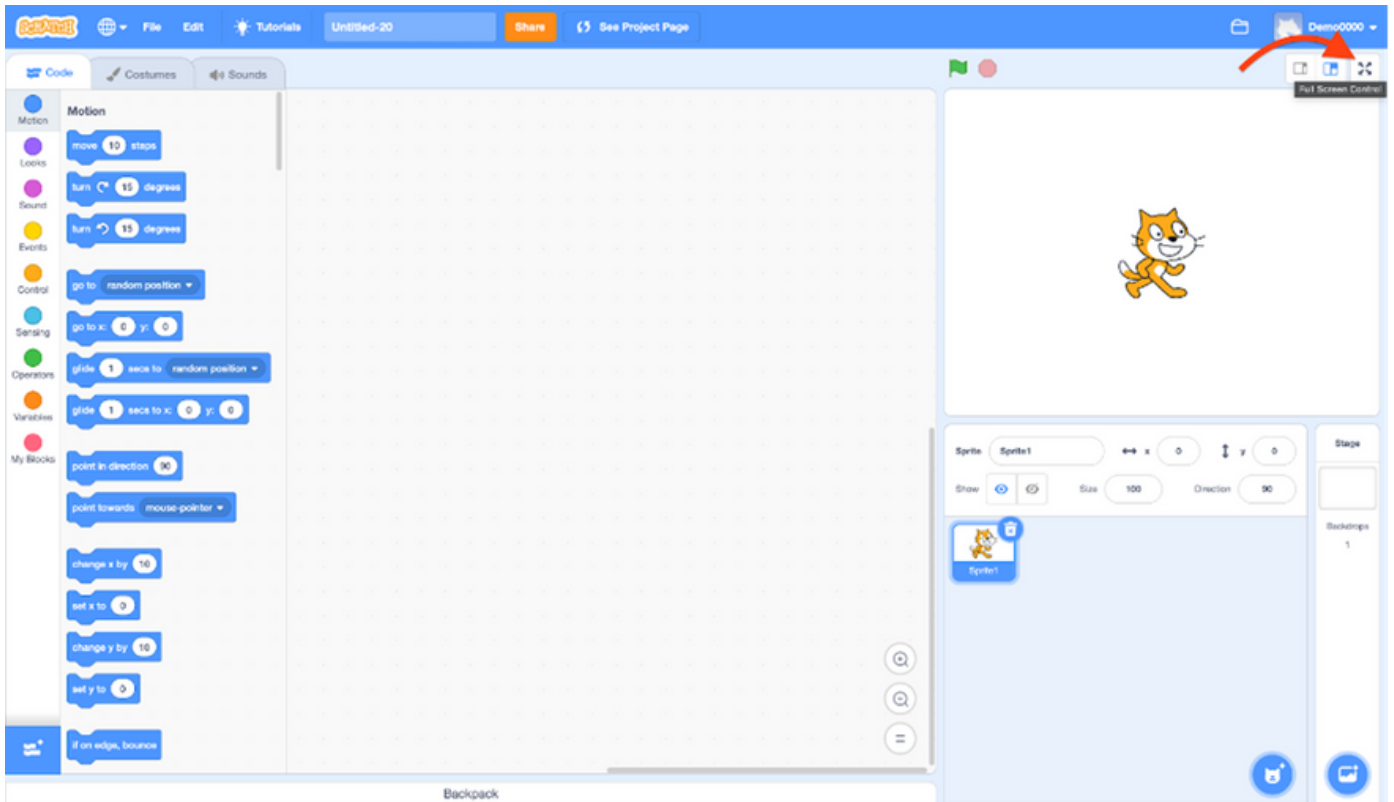
The Stage Area makes use of (x, y) coordinates for knowing the location of different objects/sprites in it. (0, 0) is the location at the center of the stage.

Below the stage area, highlighted by the red rectangle, are several controls for working on the sprites. This is the region where different sprites will be displayed. You can set the size, direction, position (in the form of coordinates) and the name of the sprites from this area.
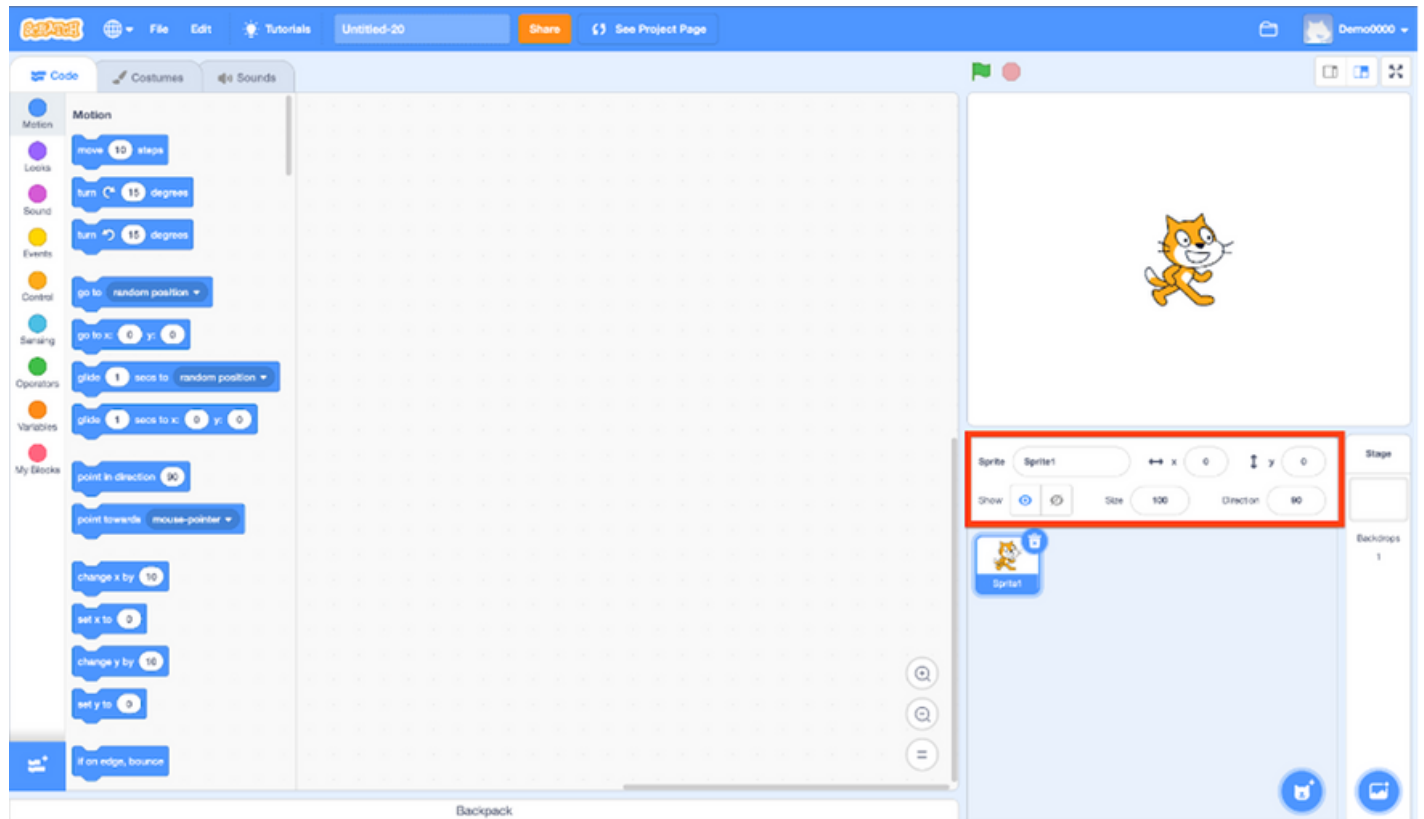
Script

The area where you bring the puzzle-like pieces of Scratch coding instructions and stack them vertically to make games, animations, or programs. Every sprite is programmed with a script.

Blocks in Scratch coding

The programming palette is categorized into nine color-coded block categories – Motion, Looks, Sound, Events, Control, Sensing, Operations, Variables, and My blocks. You can also add 11 extensions to this block category by clicking on Add extension at the bottom of the programming palette. These code blocks perform actions on sprites in your animation or games
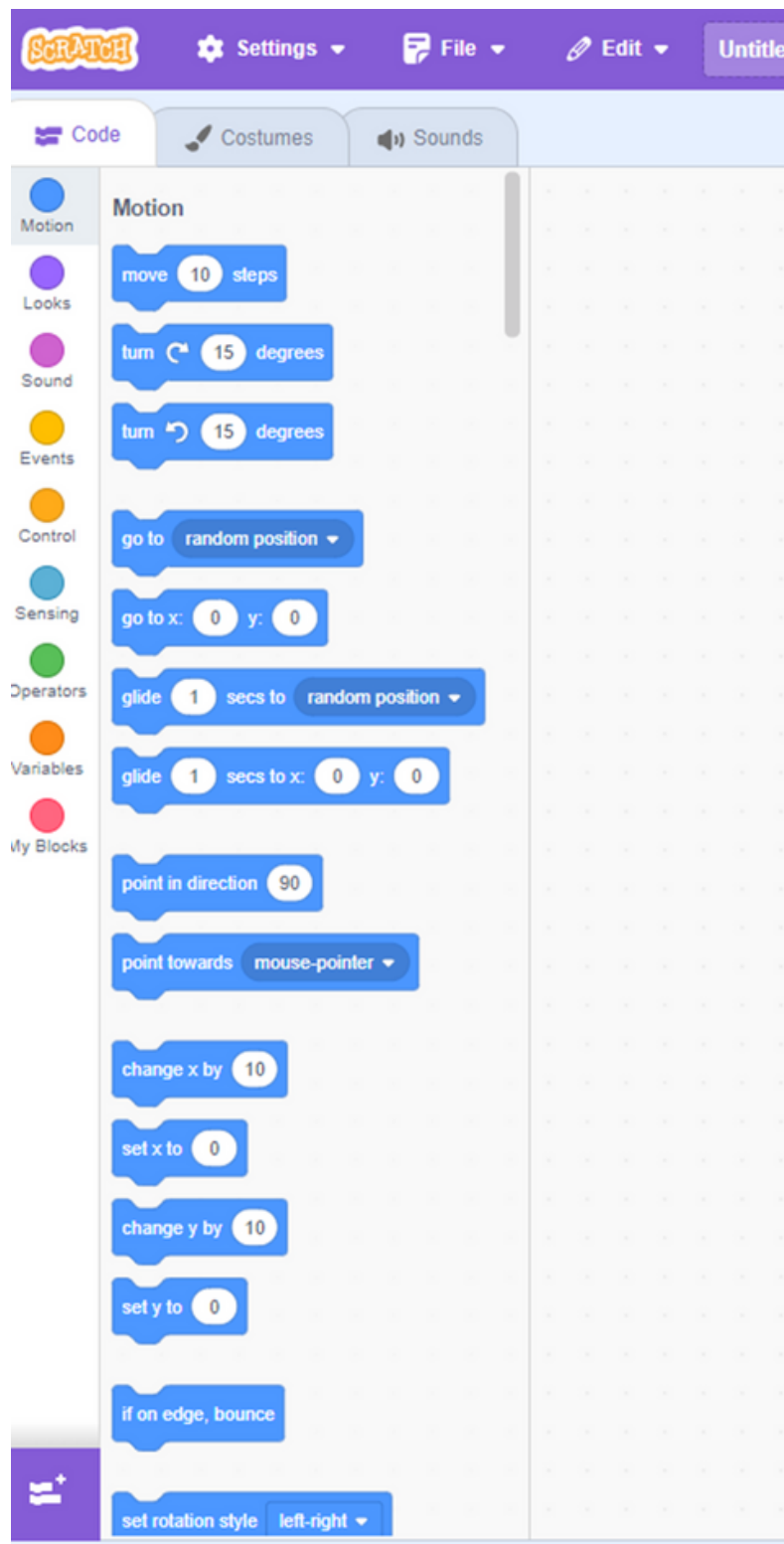
These code blocks are dragged and dropped into the script area. A collection of code blocks that fit together vertically is called a script.

1. Motion block: Motion blocks are used to control the sprite's movement, set its position, change its direction, control its moving speed, etc.
Move block - Moves the sprite by a defined number of steps.

move 10 steps
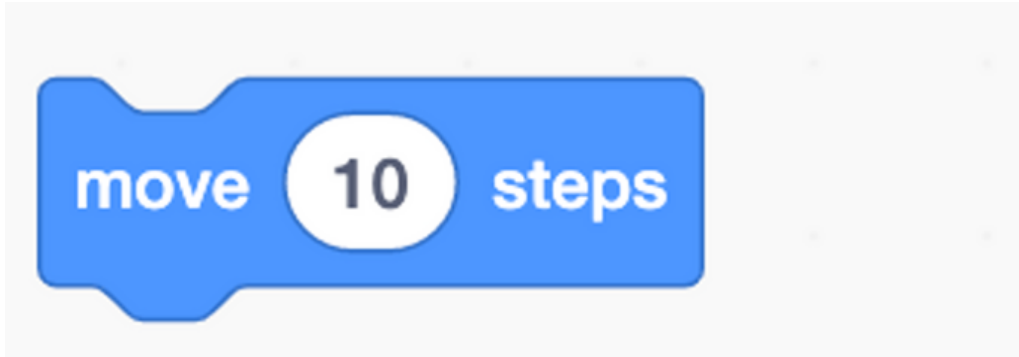
Turn degree block – It turns the sprite by a specified angle in the clockwise or anticlockwise direction.

turn ↻ 15 degrees

turn ↺ 15 degrees
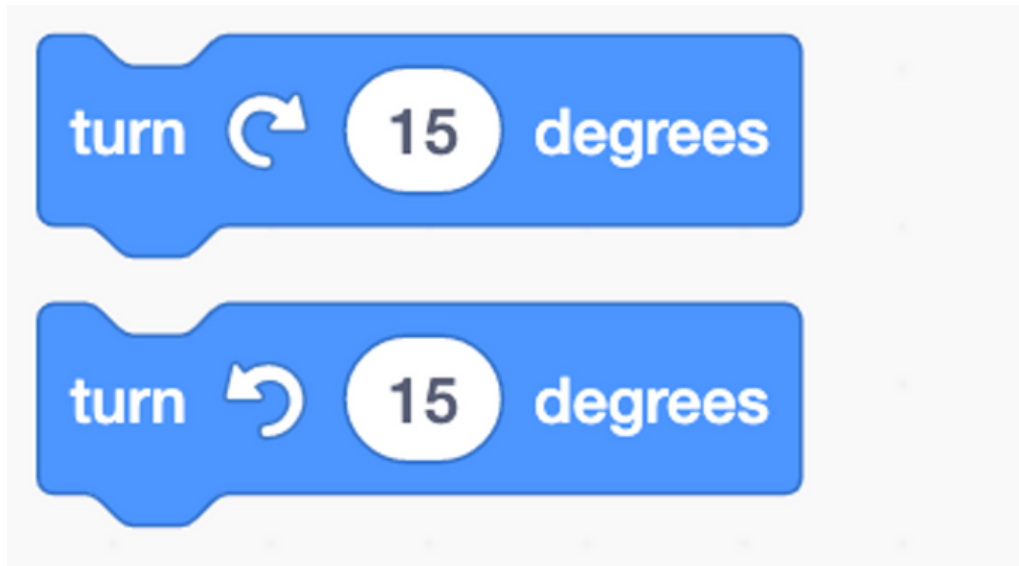
Go to block – It moves the sprite to a specific position on stage.

go to random position ▾

go to x: 0 y: 0
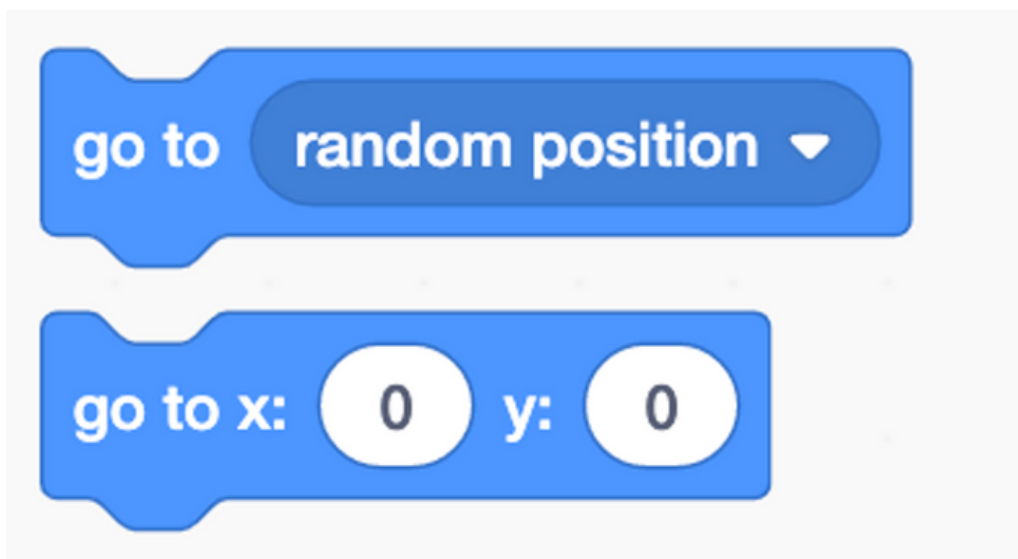
Glide block – It is used to glide the sprite to a specific position.

glide 1 secs to random position ▼

glide 1 secs to x: 0 y: 0
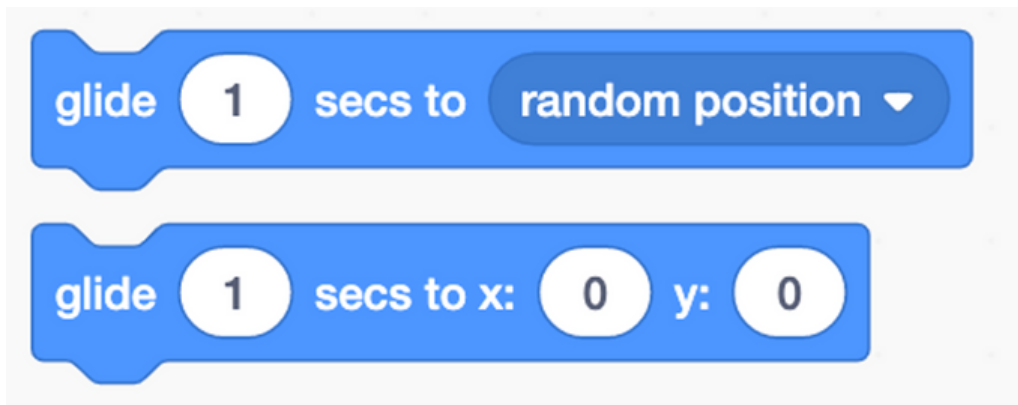
Point block – Point in any direction or towards the mouse pointer

point in direction 90

point towards mouse-pointer ▼
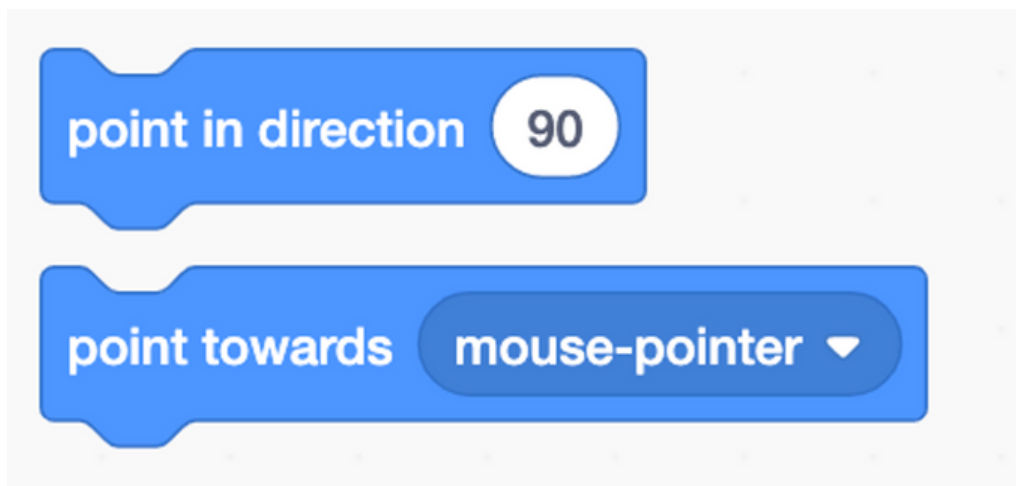
Change and set block – Move the sprite by a certain number of steps: right or left(change x position) or up or down(change y position). Set block, move the sprite to a certain position either in the x or y direction.

change x by 10

set x to 0

change y by 10

set y to 0
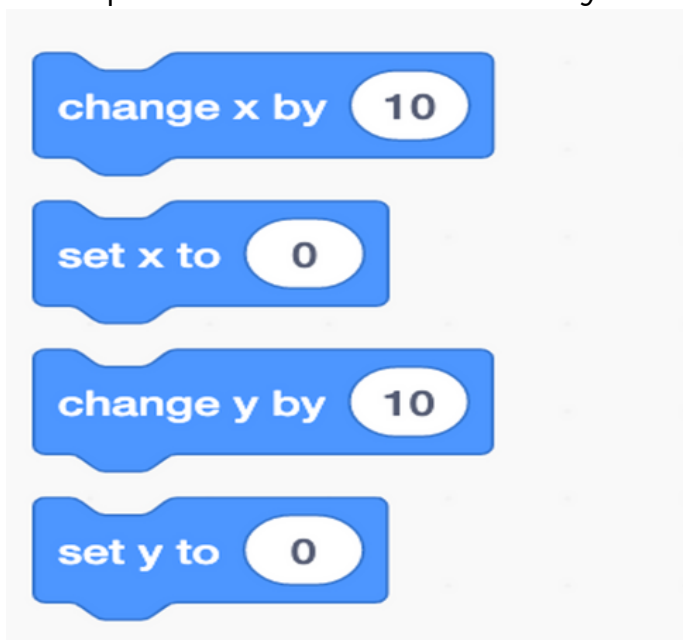
If on edge, bounce block – If the sprite touches any edges of the stage, it will bounce back.

if on edge, bounce
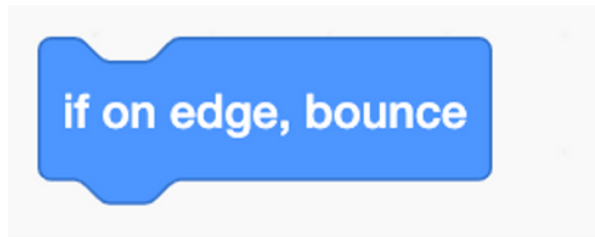
Set rotation style block – Set's the rotation style of the sprite to left-right, dont rotate or all around.

set rotation style left-right ▼
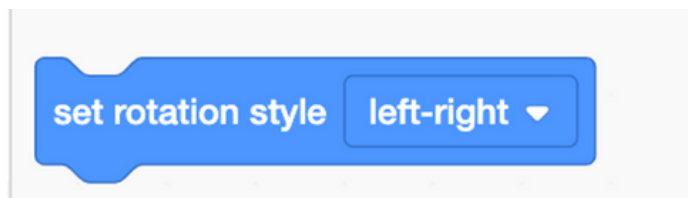
Position block – Current x or y position of the sprite.

x position

y position
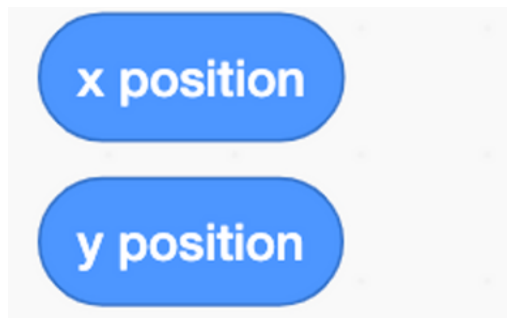
Direction block – The currency degree in which the sprite is facing.

direction
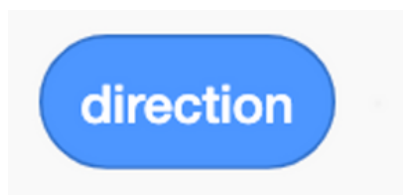
2. Looks Blocks: Look blocks work on the appearance of the sprites or how they interact.

Say and Think block – These blocks represent speech by the sprites.
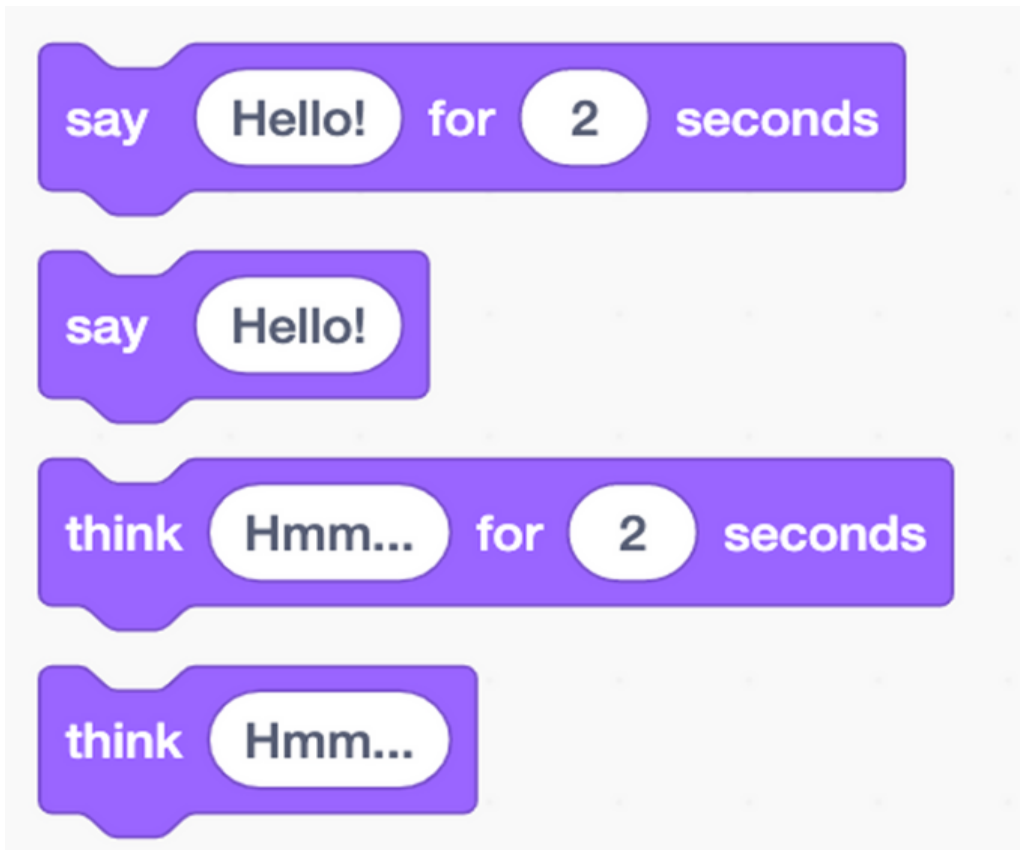
 Switch costume block – Changes the costume of the sprite.
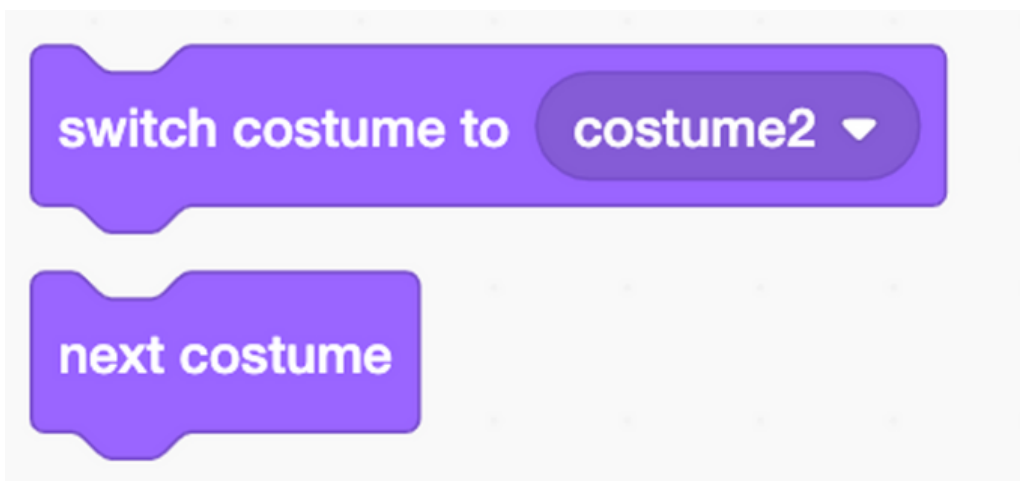
Switch backdrop block – Changes the backdrop.

switch backdrop to backdrop1 ▼

next backdrop
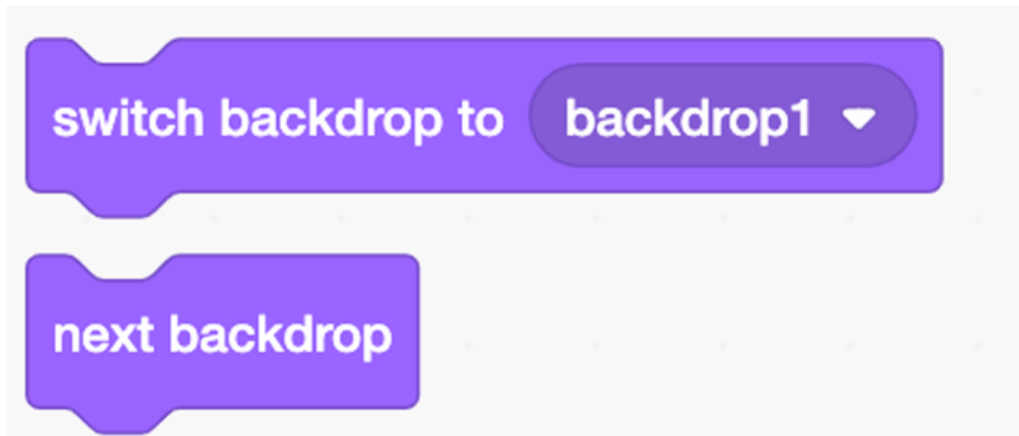
Change and set size block – Change or set the sprite size using these blocks.

change size by 10

set size to 100 %
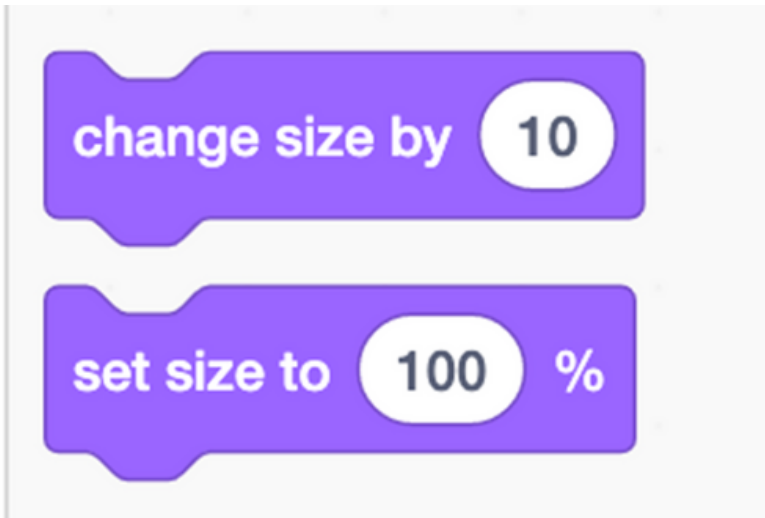
Show/Hide block – Show or hide the sprite from the stage.

show

hide
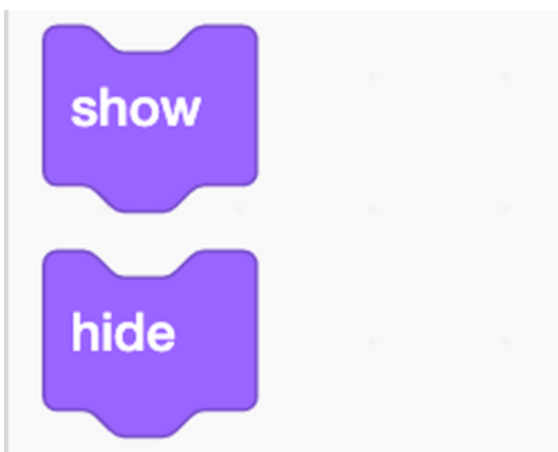
Change effect block – Change the selected effect like color, brightness, etc. for a sprite by a certain amount.
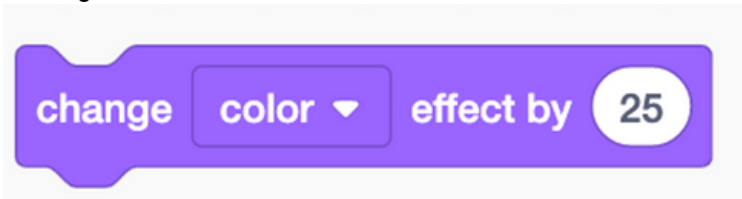
Set effect block – Set the selected effect like color, brightness, etc. for a sprite by a certain amount.
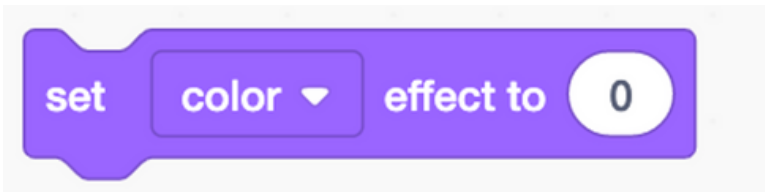
Clear graphic effect block – Remove all the effects of a sprite.
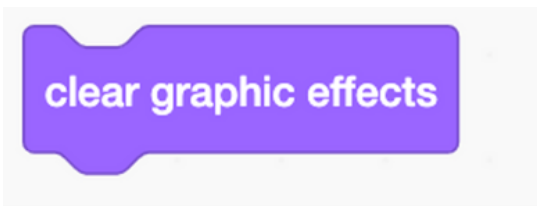
Go to layer block – Make the sprite go to the front or back layer.
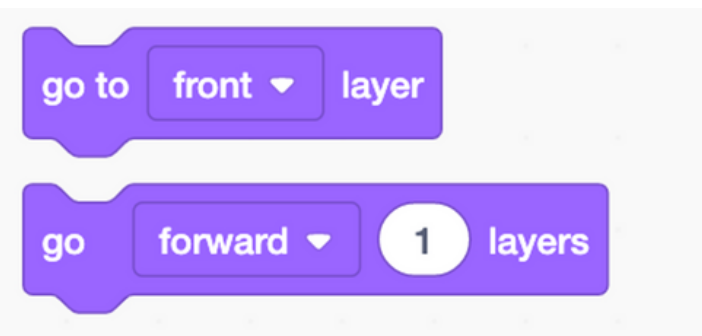
Size block – Size of the sprite
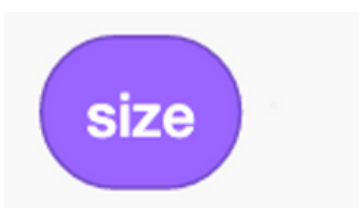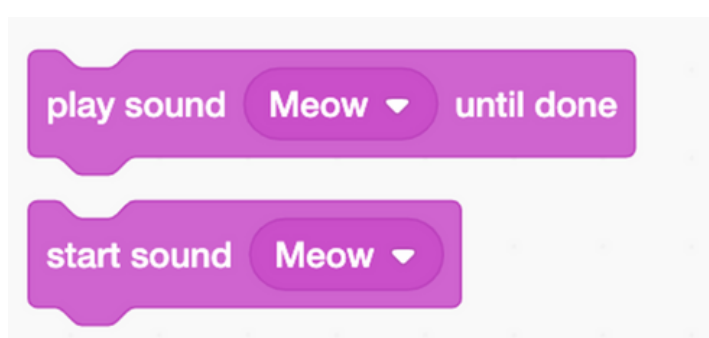
Costume block – Select the current costume name or number.
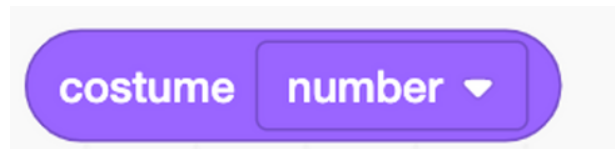
Backdrop block – Select the current backdrop name or number.
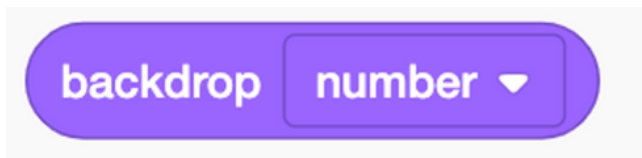
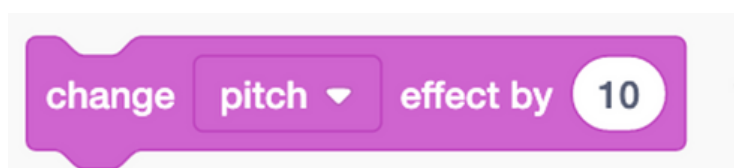**3. Sound blocks**: Using these blocks you can add sound effects to a sprite.
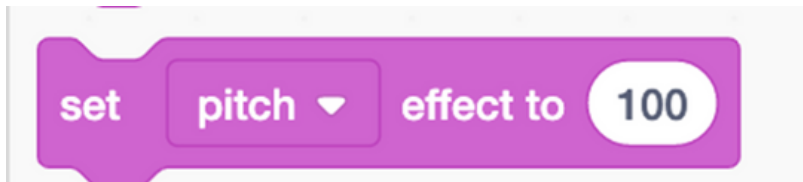**Play/ Start sound block** – Plays the selected sound.

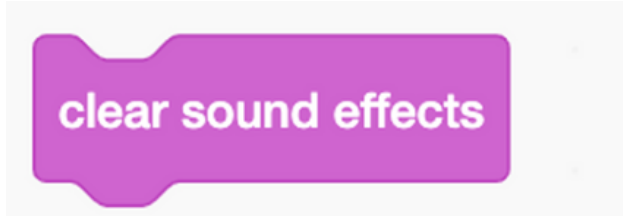**Stop all sounds block** – This block stops playing all the sounds.
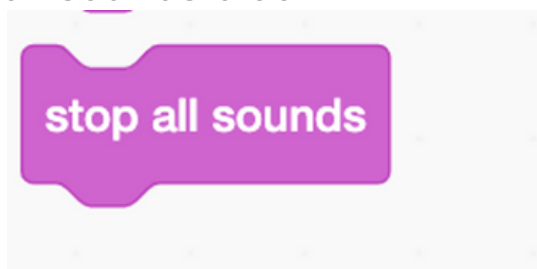
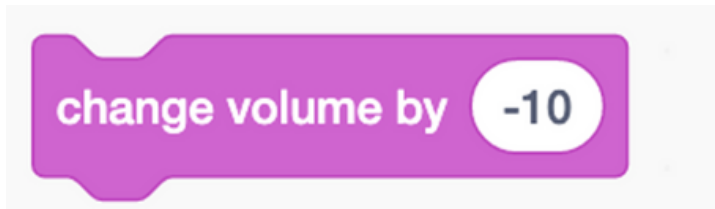**Change pitch effect block** – This block changes the pitch of the sound by a specific value.

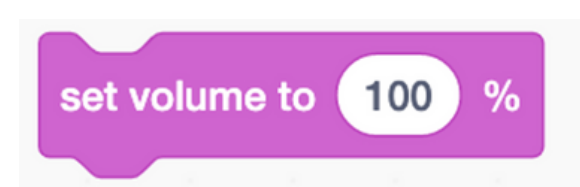**Set pitch effect block** – This block sets the pitch of the sound to a specific value.

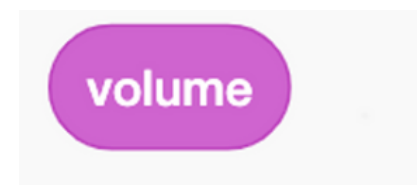**Clear sound effect block** – Clears any sound effect used.

Change volume block – You can increase or decrease the volume by a certain amount.

Set volume block – Set the volume of sound effects to a certain percentage.


Volume block – Value of current volume.

4. Events blocks –Events blocks are used to trigger the execution of scripts. An event block defines when a script has to be run.
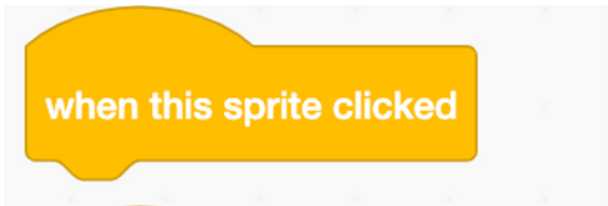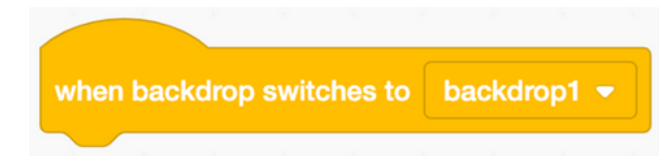**When green flag clicked block** – The blocks attached below this block will run when the green flag is clicked.

**When space key pressed block** – The blocks attached below this block will run when the selected key is pressed.
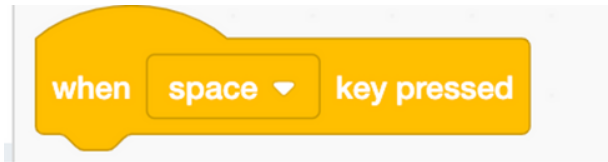
When this sprite clicked block – When the sprite gets clicked, the blocks attached below this block will run.
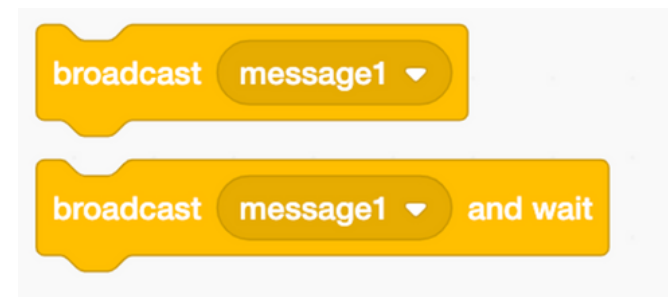

When backdrop switched to block – When the backdrop is switched to the selected backdrop, the blocks attached below this block will run.

When loudness block – The blocks attached below this block will run when the computer hears the sounds louder than the specified value.
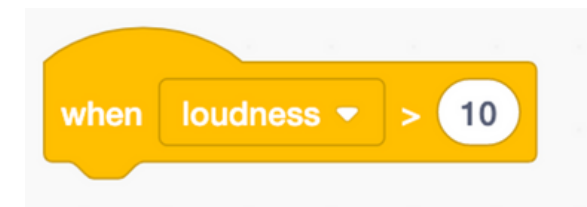
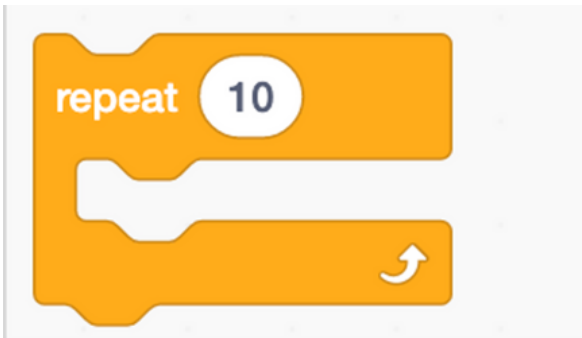**Broadcast message block** – Broadcast a specific name message to other sprites.

5. Control blocks: Control blocks are the logical blocks. It teaches the concept of loops and conditionals in coding.
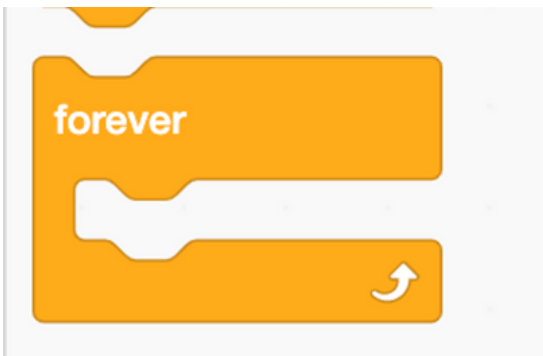
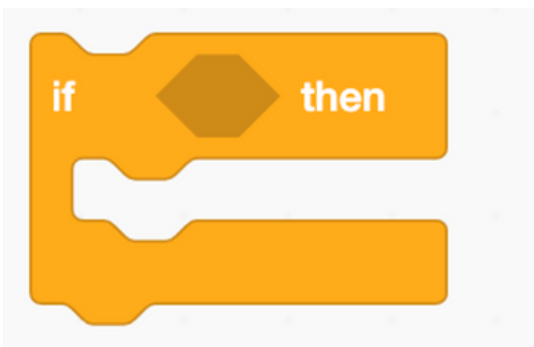**Wait block** – Pauses the script for a specified second.

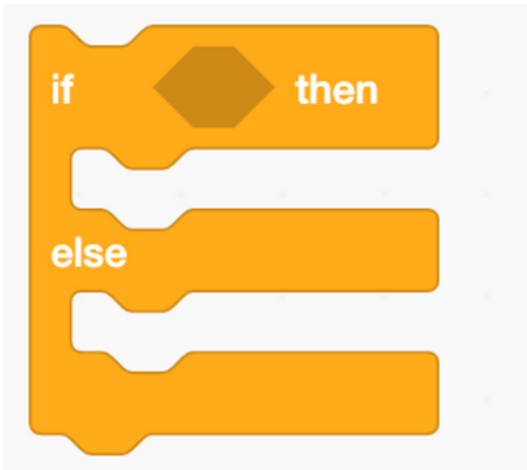**Repeat block** – The blocks inside the repeat block will run for a specified number of times.

**Forever block** – The blocks inside the forever block will run again and again till the game is stopped.

If then block – Runs the blocks inside the if block only if the specified condition is met.
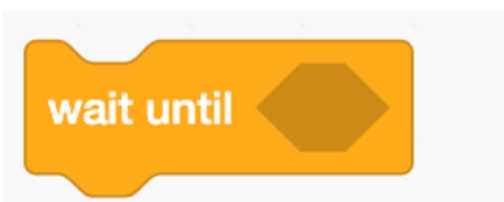
If then else block – Runs the blocks inside the if block the specific condition is met. If the condition is not met, the blocks inside the else block will run.
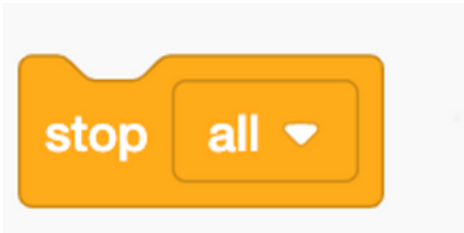

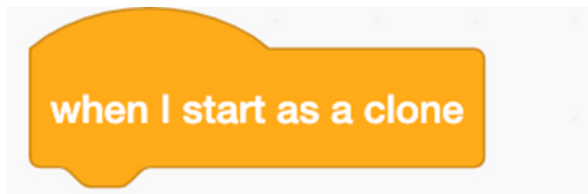**Repeat until block** – Runs the blocks inside the repeat until block, until the specified condition is met.
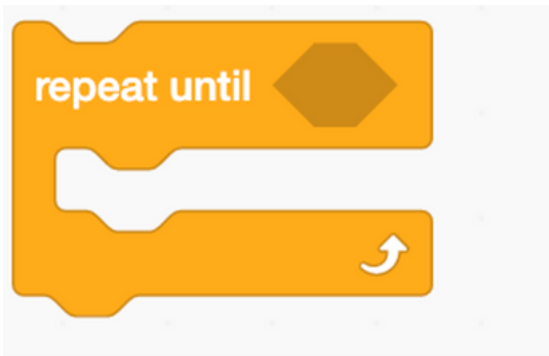
Wait until block – This block pauses the program until the specified condition is met.
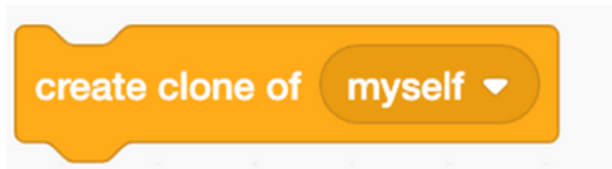

Stop block – Stops the selected script in the program.
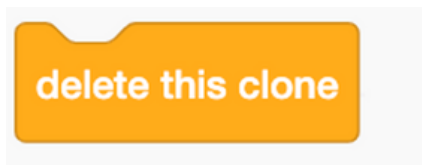
When I start as a clone block – It's an event block that controls the clone.

Create clone block – Creates a clone of the sprite.

Delete this clone block – This block deletes the current clone, making it disappear from the stage.
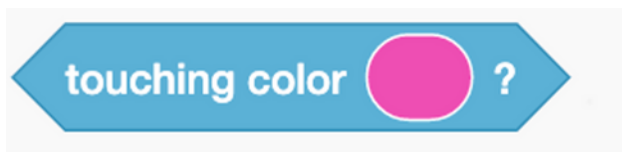
6. Sensing blocks–This set of blocks is used for detecting things.

Touching block – This block checks if the sprite is touching the mouse pointer or the edge.

Touching color block – This block checks if the sprite is touching the specified color.
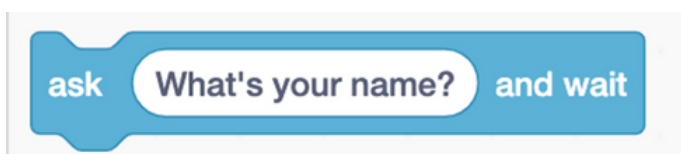

Color is touching block – This block checks if the first color is touching the second color.
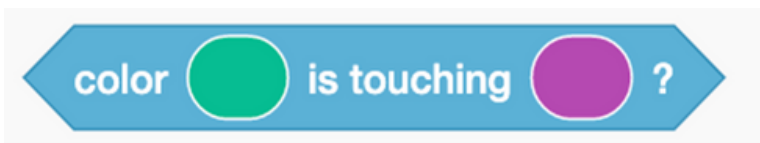
Distance to mouse pointer block – Distance between the sprite and the mouse pointer.

Ask block – This block shows the specified question text next to the sprite, and a text box at the bottom of the stage, to enter the input.

Key pressed block – Checks if the selected key is pressed on the keyboard.

key space ▼ pressed?

Mouse down block – Checks if the mouse button is clicked.

mouse down?

Mouse x/ Mouse y block – The current x and y position of the mouse.
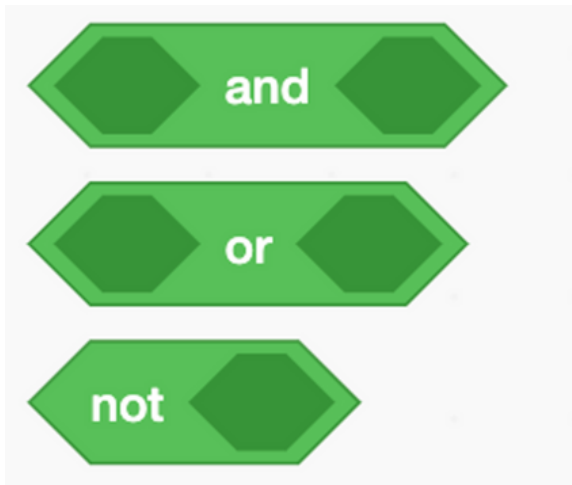
mouse x

mouse y

7. Operators block – Operator block performs different functions such as Mathematical functions like addition, subtraction, multiplication and division.
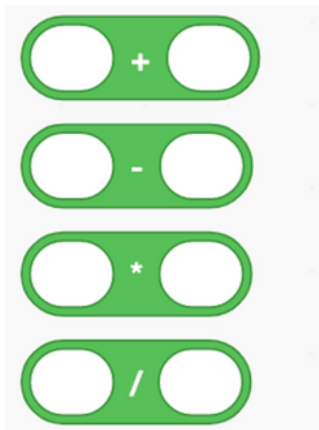
Perform a comparison between two numbers like greater than, less than and equal to.

Combine conditions such as And, Or and Not.

Perform string handling, such as joining two strings, and calculating number of letters in a string or length of the string.


8. Variable block – Variable blocks are used to create variables for storing numbers, letters, or special characters like colons, exclamation marks, etc. This set of instructions includes blocks for creating or setting variables, changing their values & making variables visible or invisible.

9. My blocks – My Blocks is used when you want to create a custom block using the already given blocks. This custom block can be saved and then used in the script whenever required. This block comes helpful when you think that a specific set of instructions has to be used repeatedly in a program.

How to create a Scratch project?
To create a Scratch project, click on the 'Create' button on the top of the Scratch homepage. You will then be redirected to the Scratch editor, where you can start creating your project. By default, there will be a cat sprite added; you can either use it or replace it with another sprite.
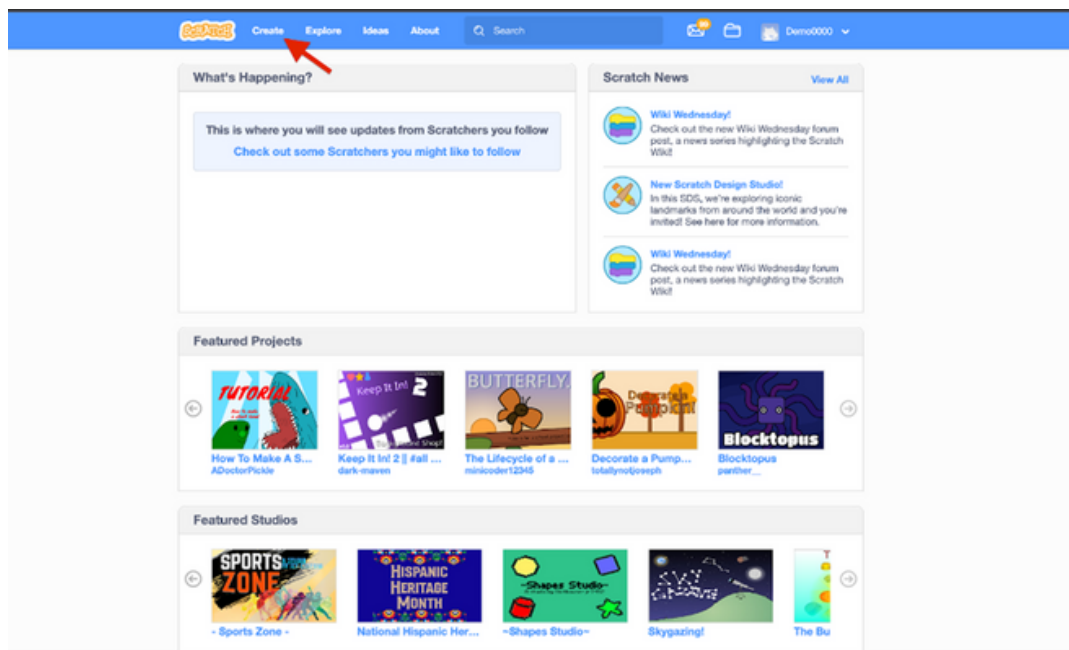
How to save your Scratch project?
You must be logged in to Scratch to save your projects. When you start creating a project on Scratch, Scratch auto-saves the work. You can also manually save the project by clicking on **'Save now'** on the top of the Scratch editor.
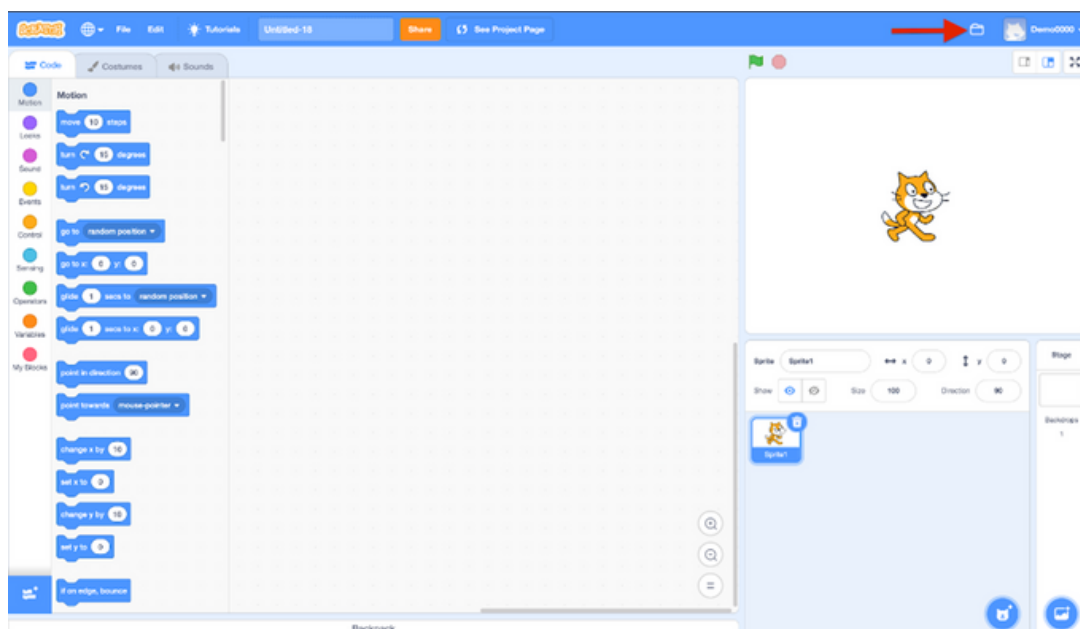
How to share your Scratch project?

Scratch allows you to share your projects online with others as well.
Follow the below steps to share your project-
1. On the Scratch homepage, click on your username in the top right corner and click on **'My stuff.'**
2. On the My stuff page, you will find the list of projects created by you. Click on the required project that you want to share.
3. You can also add instructions for other users on how to use your project.
4. Click on the orange **'Share'** button on the top.
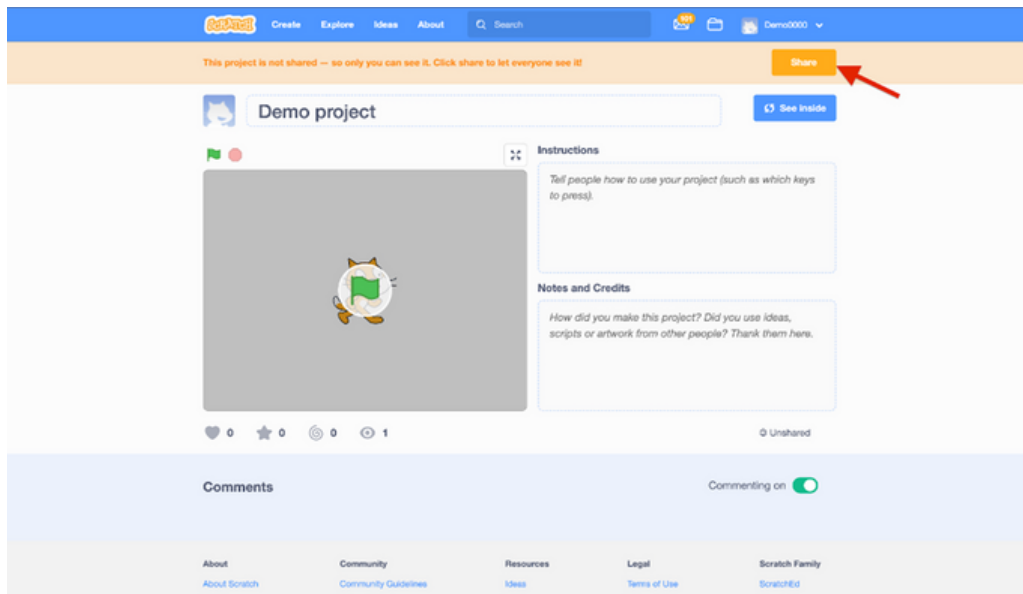
5. Your project is shared now. Click on **'Copy link'** to share your projects with others.
People can view your project, remix it and also comment on it. You can not share your project from the offline editor