Block Programming Scratch

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Agenda

Base Concepts of Programming

Variables and Statements

Block Programming

Scratch

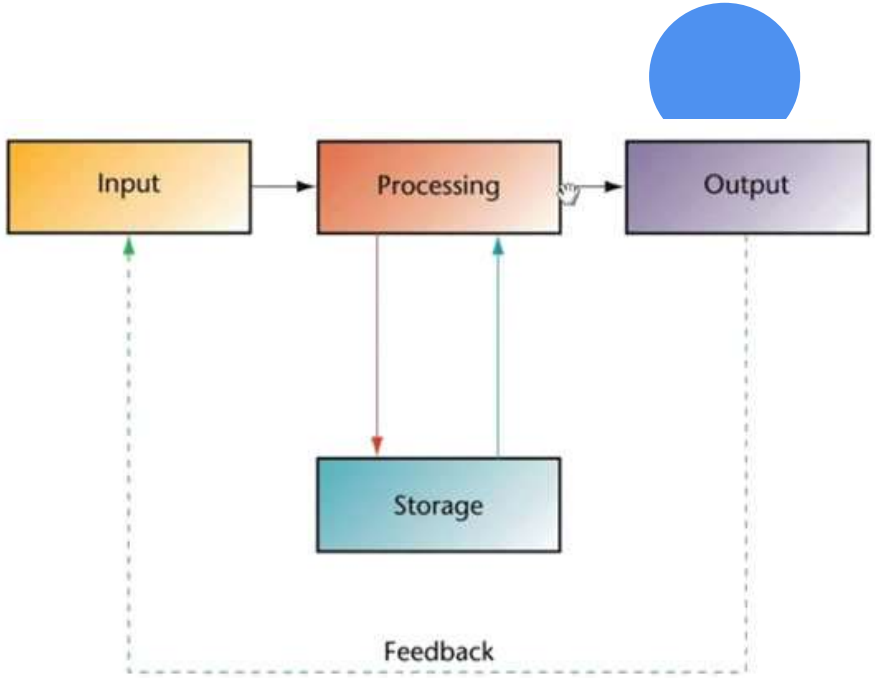
Base concept of programming

What is and How it works

Programming

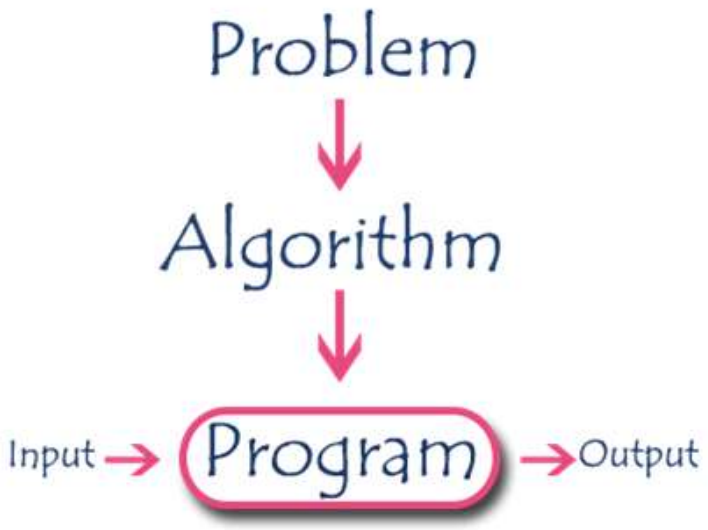
Programming is the implementation of logic to facilitate specified computing operations and functionality.

Programming prepares the computer to perform a set of ordered actions on a data set in order to solve a problem.



Algorithm - Program

Algorithm is a human-intelligible procedure that allows the resolution of a problem by breaking down the procedure into an ordered set of actions



Program is a sequence of instructions that the machine can understand.

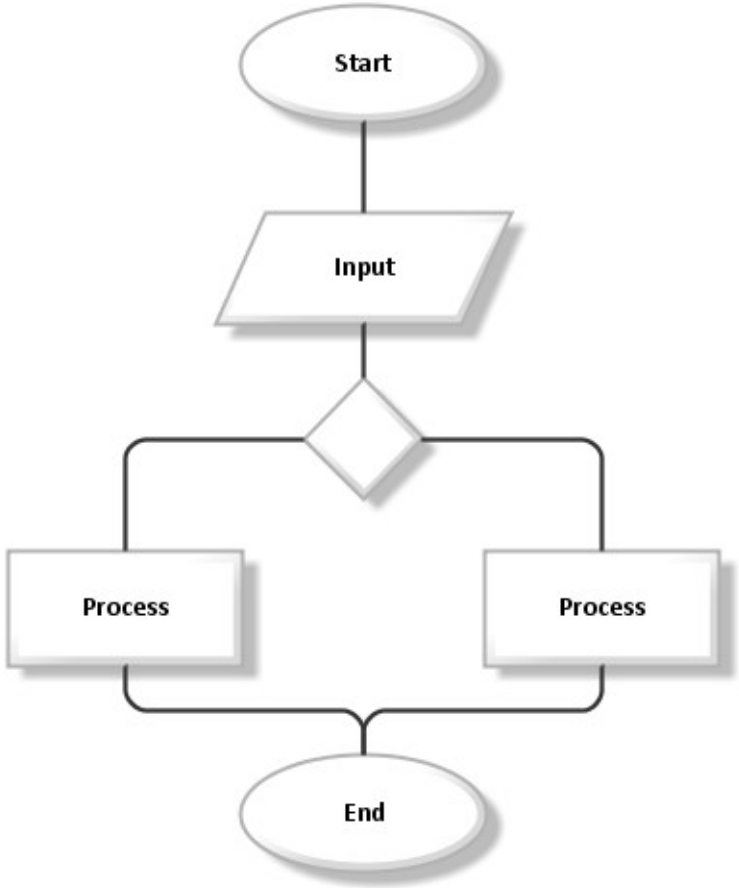
Algorithm - Flow chart

Flowchart is a visual representation of the sequence of steps and decisions needed to perform a process.

Each step in the sequence is noted within a diagram shape. Steps are linked by connecting lines and directional arrows.

They help us visualize complex processes, or make explicit the structure of problems and tasks.

Flowchart is useful to represent in a easy way algorithms.



Algorithm - Flow chart

Flowchart symbols:

Ellipse

Start/End: represents the starting or ending point of the system

Rectangle

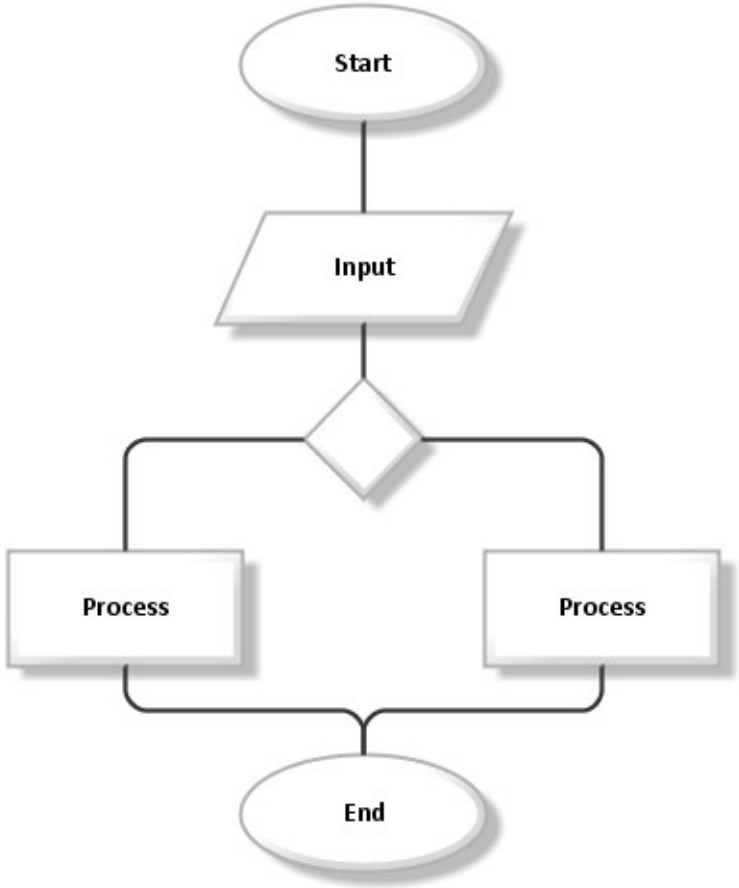
Process: indicates some particular operation

Diamond

Decision: A diamond represents a decision or a branching point. A decision test that can be true or false. Lines coming out from the diamond indicates different possible situations, leading to different sub-processes.

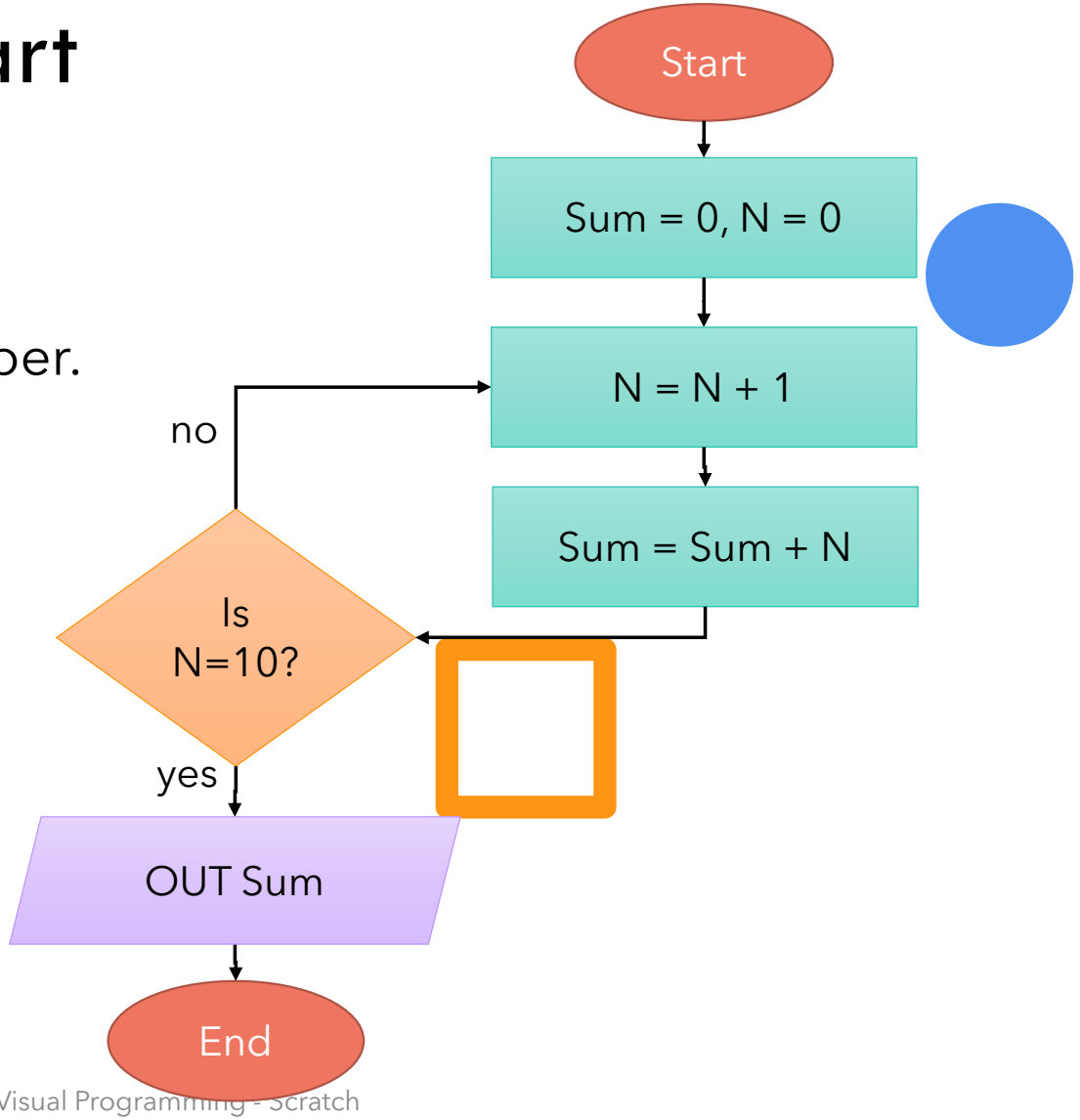
Parallelogram

Data: It represents information entering or leaving the system. An input might be an order from a customer. Output can be a product to be delivered.



Algorithm - Flow chart Example

Find the sum of the first 10 number.



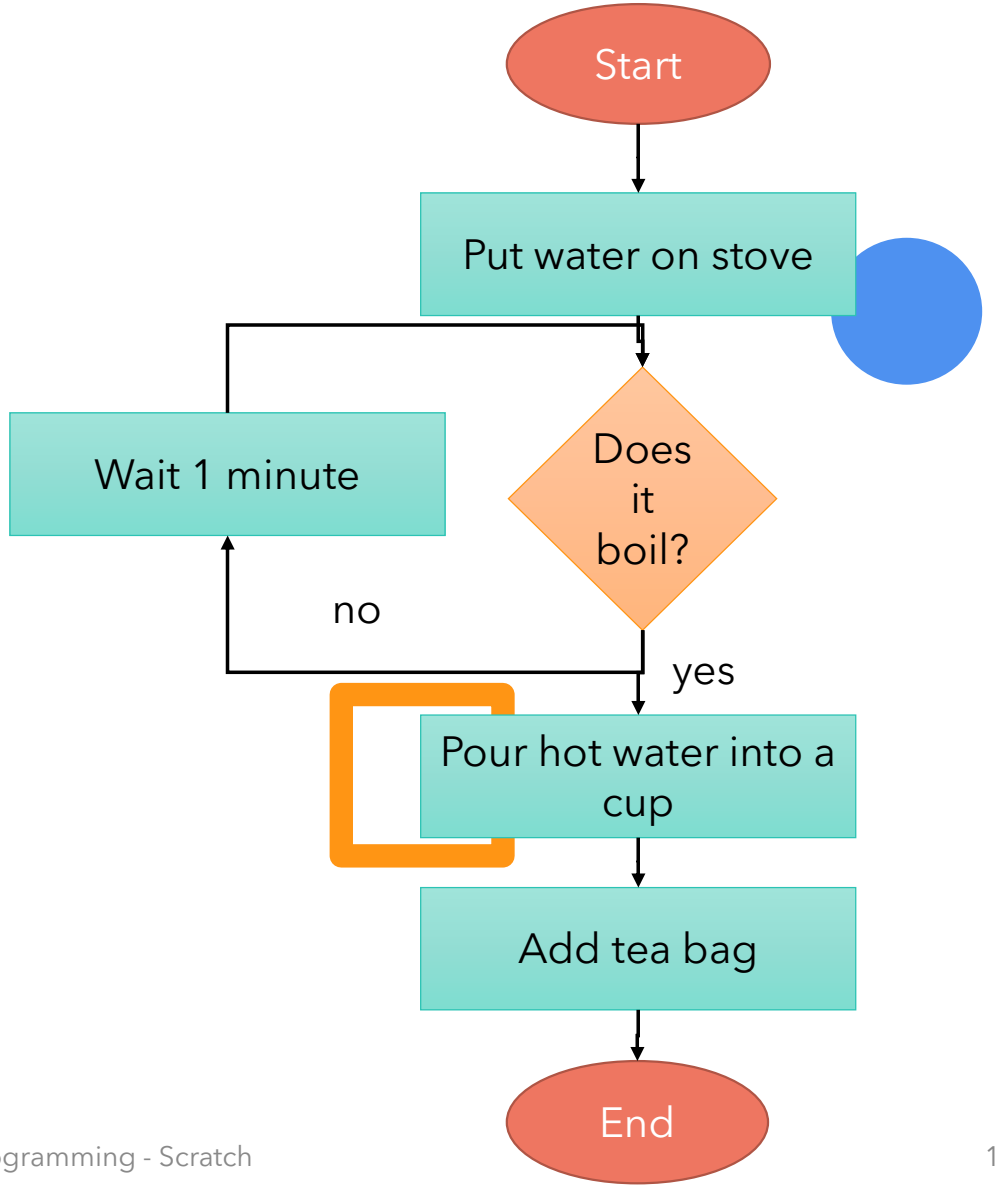
Let’s make it together

Problem: How to make tea.

Let’s make it together

Problem: How to make tea.

Solution:



Now, You Try.

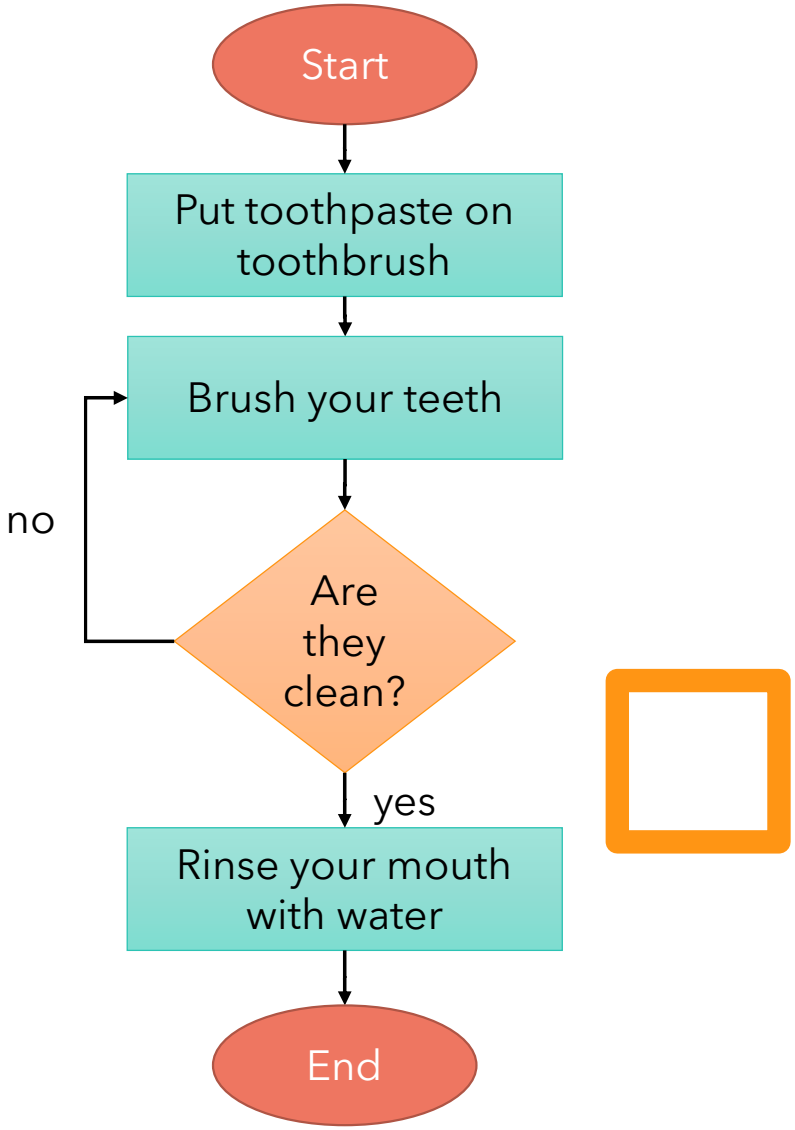
Problem: Brush your teeth

Use Jamboard: jamboard.google.com/

Now, You Try.

Problem: Brush your teeth

Solution:




Variables and Statements
What are and How they work

Variable and Costant

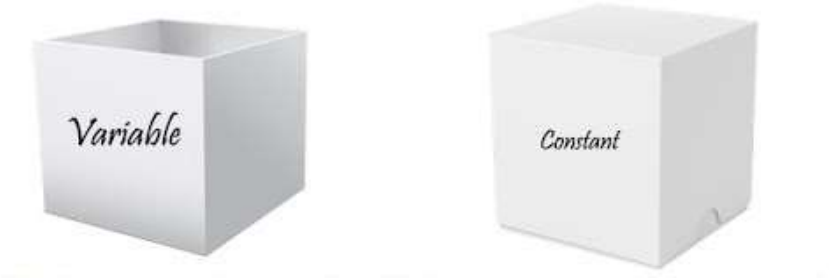
Variable

- is a name – value pair
- Value can be changed anytime during the execution of the program.

Costant

- is a name – value pair
- Value is not changed during the execution of the program.

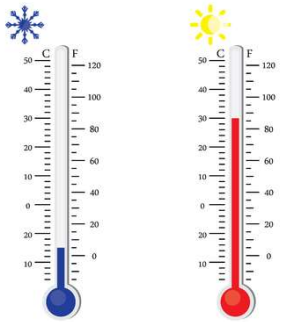
You can think variable and costant as a box on which a name is written and which can contain a value inside it, variable is an open box while costant is a close box



Variable and Costant - Example

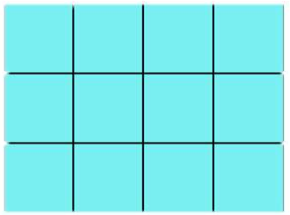
Variable

- It is a quantity that can take on different values
  - Price of an object
  - Temperature of Perugia
  - Work hours during a day



Costant

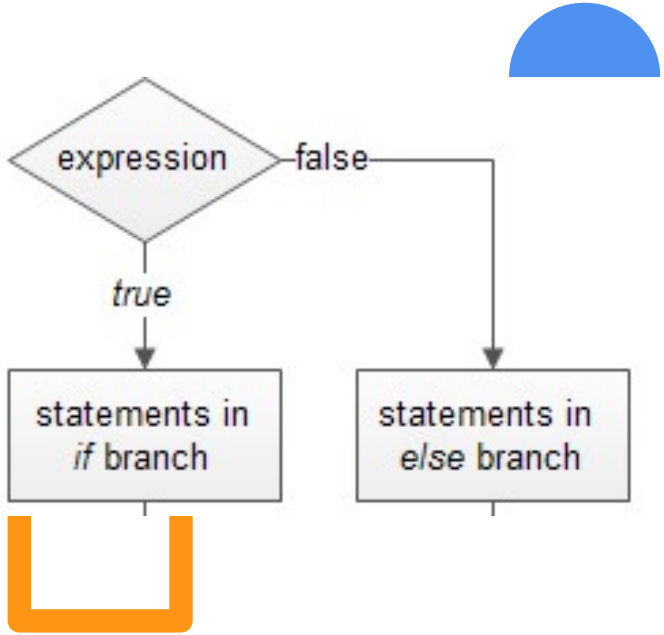
- It is a quantity that take on always the same value
  - Weight of an object
  - Number of egg contained in a dozen
  - Rectangle area with base 4 cm and height 3 cm



Statements: If else

If - else is a decision-making statement that guides a program to make decisions based on specified criteria.

Depending on whether the condition is true or false, computer executes one set of code (true) or another one (false).

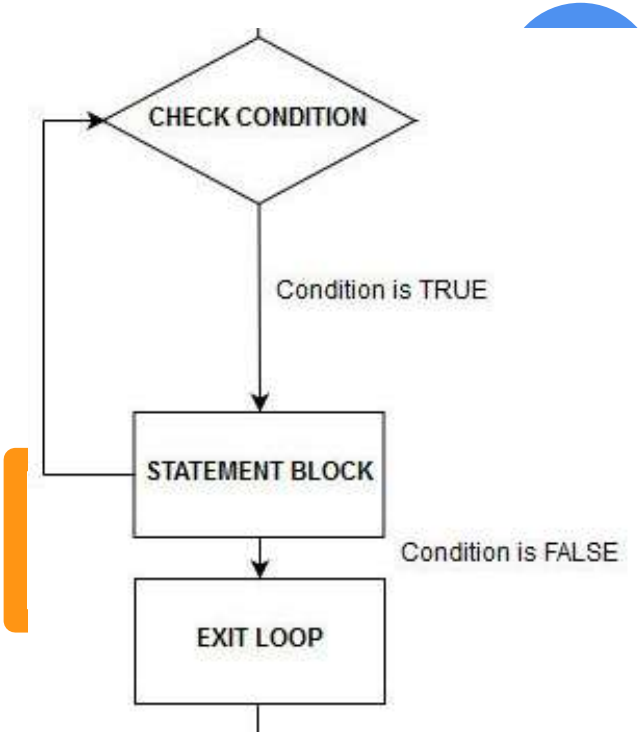


Statements: Loop

A **loop** is a sequence of operations that will repeat over and over again.

There are two types of loops:

- while loops: will repeat until a condition is no longer true
- for loops: will repeat a certain number of times

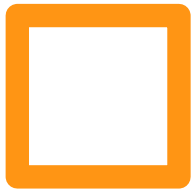


Statements: Loop - While

While loops: will repeat until a condition is no longer true

It is used when you DON'T know in advance how many times the same block of code must be repeated

For example: the floor is dirty and I have to clean it. I have to wipe the rag until the floor is clean.



Statements: Loop - For

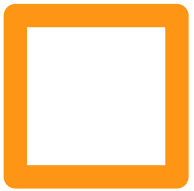
For loops: will repeat a certain number of times

It is used when you know in advance how many times the same block of code must be repeated

A for loop can always be transform in a while loop.

For example: I did my shopping at the supermarket and I have to pay 10 euros. I only have 2 euro coins in my wallet. I have to give to the cashier 5 times 2 euro.

```
for (i=0; i < 5; i=i+1)
    give 2 euro to the cashier
```



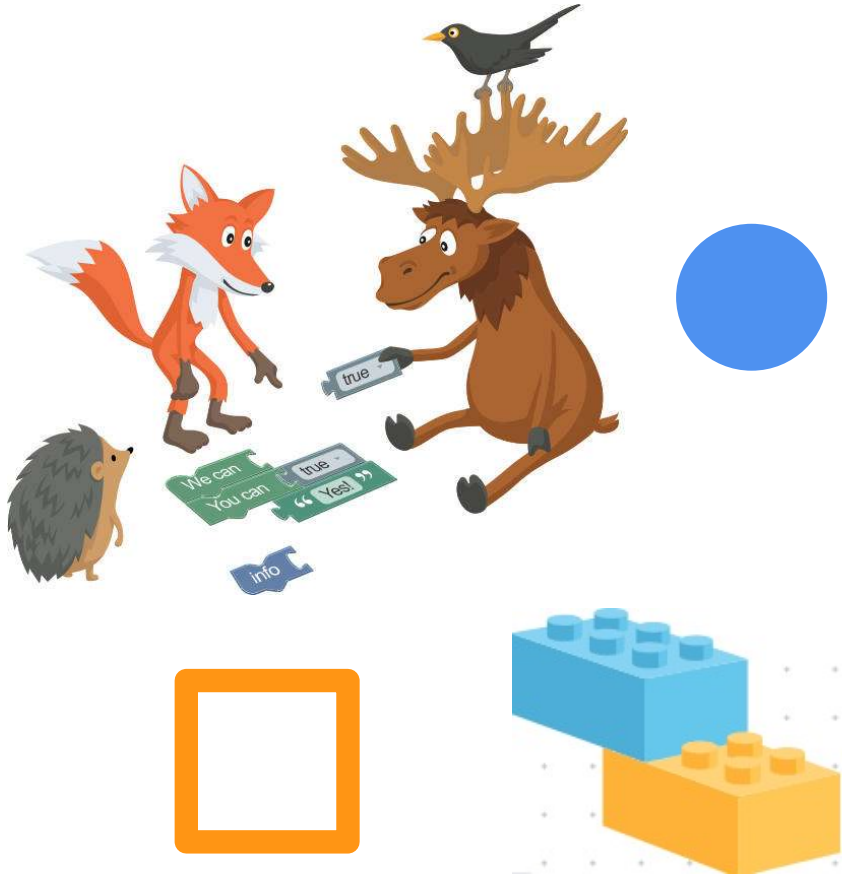
Block Programming

What is and How it works

Block Programming - Visual Programming

Block-based programming evolved as branch of visual programming.

Block Programming is a lexical structure of source code which every instruction is a block or a group of blocks.



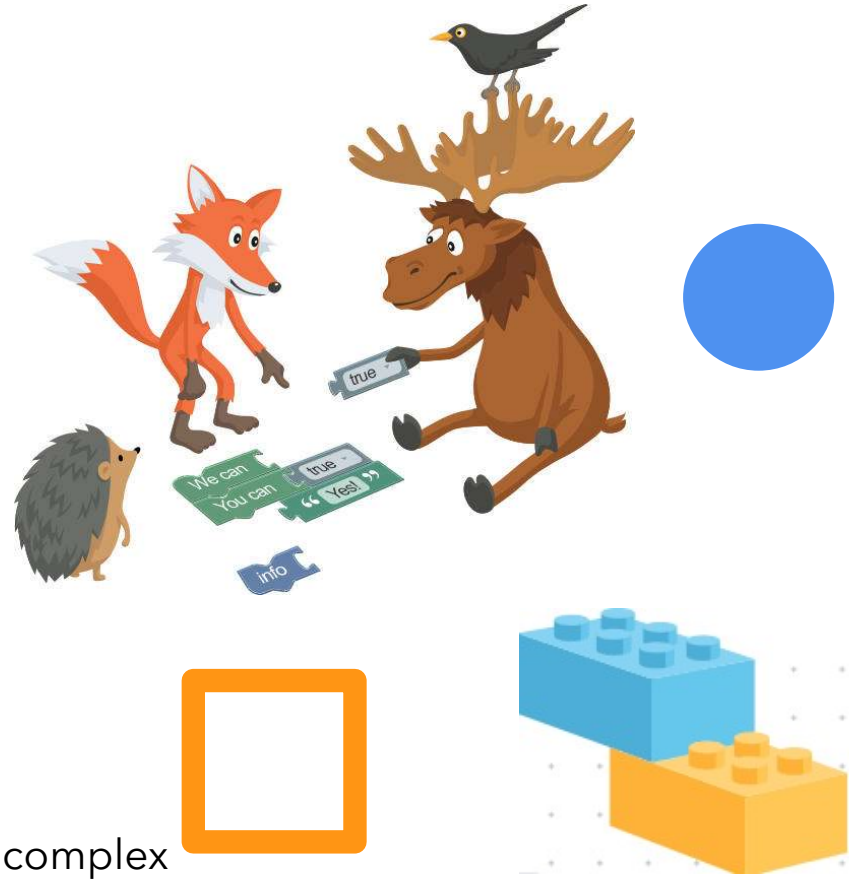
Block coding is just as powerful and useful as text-based language, but easier to use and understand.

In the Block-based coding the developer have only to drag and drop blocks.

Block Programming - Visual Programming

The **main goal** of visual programming is to make programming **more accessible** at 3 different levels:

- Syntax – the use of block/icons, diagrams, and forms to eliminate syntactic errors.
- Semantics – usage of meta-information to document and explain the program.
- Simulation – generally include visual mechanism to check program behavior.



Advantages:

- ❑ Accessible and fast
- ❑ More readable thanks to colors and shapes

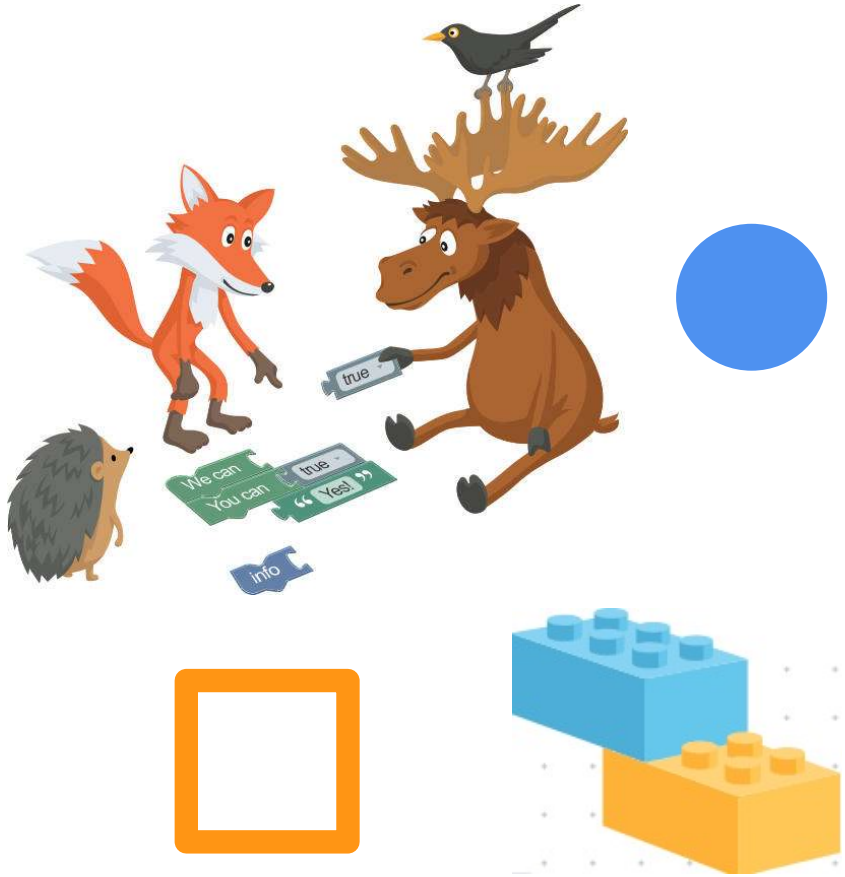
Disadvantages

- ❑ Not good for complex game or software

Block Programming

This approach became predominant in introducing kids to programming and is used all over the world now.

Today, over 40 million users actively use block coding with **Scratch** and 50 million children learned how to program with **code.org**.

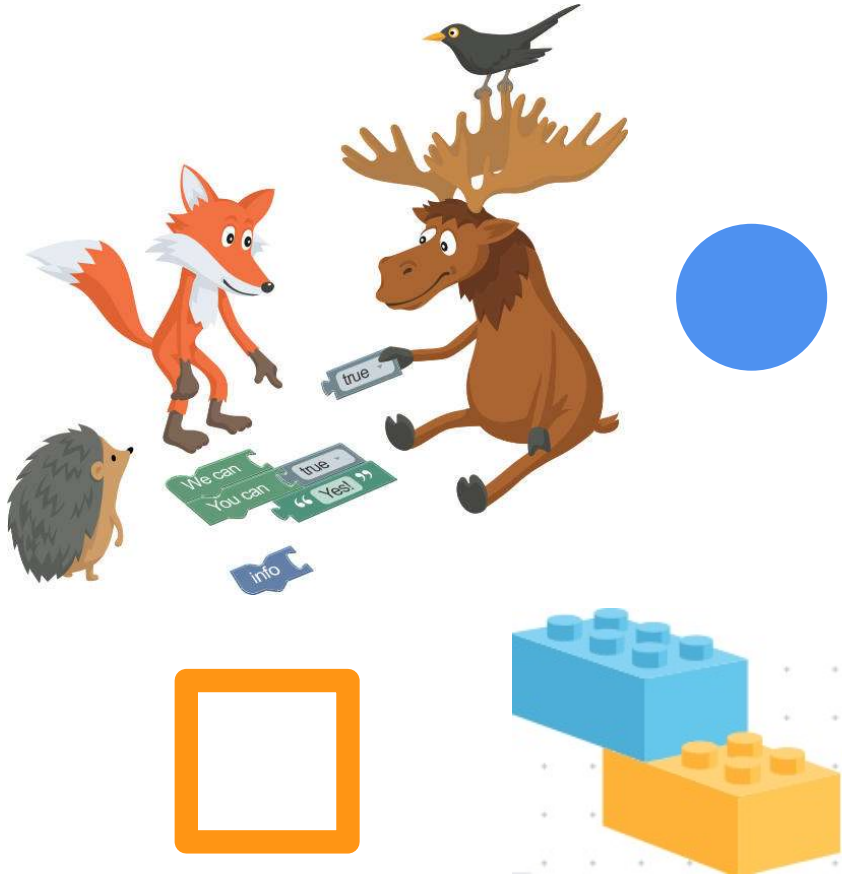


Block Programming – Code.org

Videotutorial:
https://videos.code.org/csf/maze-intro.mp4

Workshop 1 - Programming with Angry Birds: https://studio.code.org/s/coursec-2021/lessons/3/levels/2

Workshop 2 – Creating Art with Code: https://studio.code.org/s/coursec-2021/lessons/6/levels/2



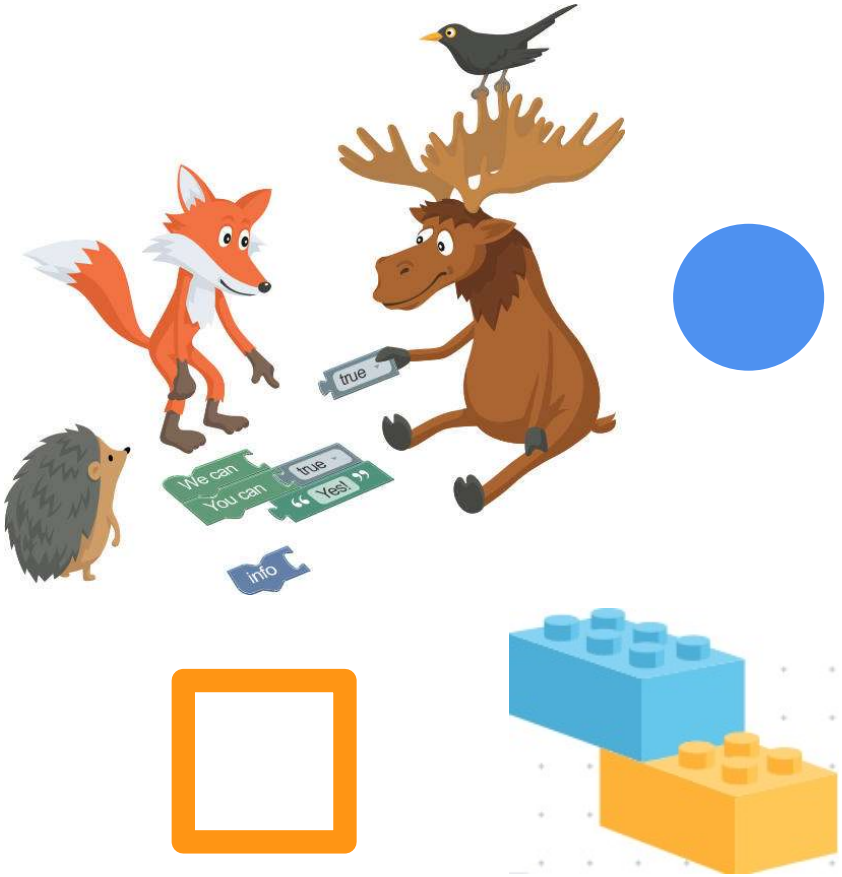
Block Programming – Code.org

Videotutorial: **https://youtu.be/SJgje3OuTJY**

Workshop 3 – Loops with Rey and BB-8:
https://studio.code.org/s/coursec-2021/lessons/8/levels/2

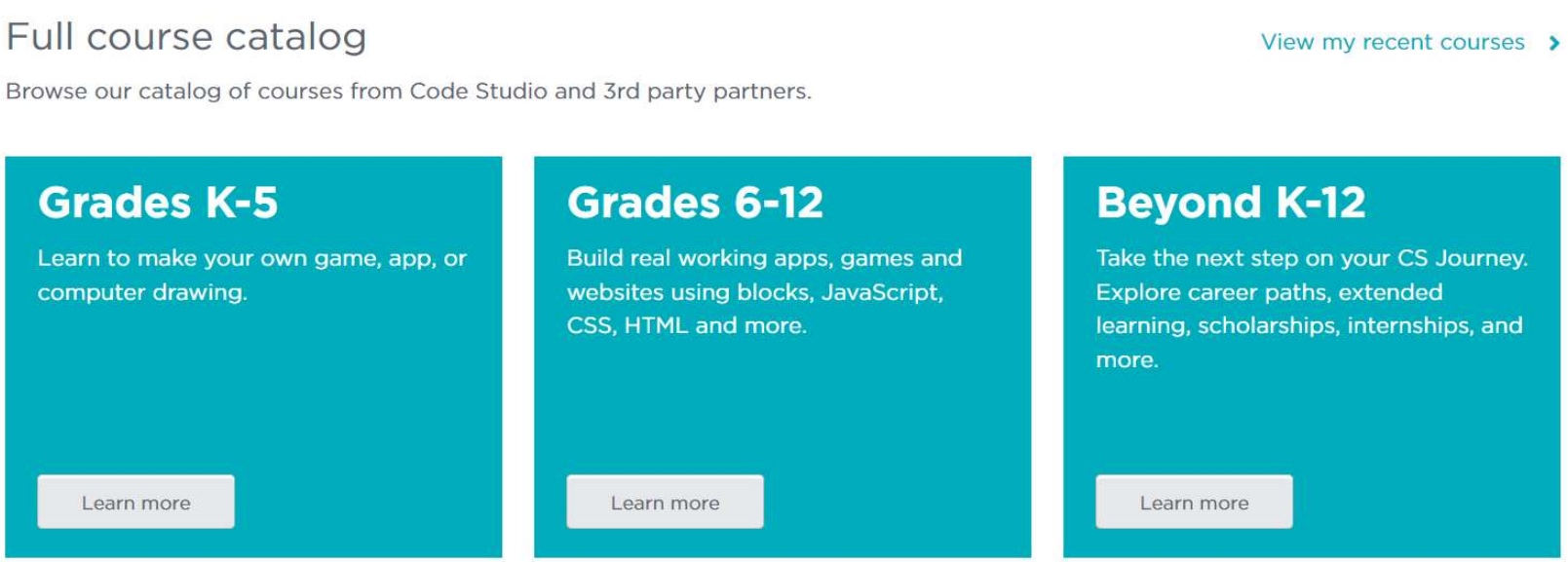
Videotutorial: **https://studio.code.org/s/coursed-2021/lessons/14/levels/1**

Workshop 4 – If/Else with Bee:
https://studio.code.org/s/coursed-2021/lessons/14/levels/2



Code.org

https://studio.code.org/courses



Scratch

What is and How it works

Scratch

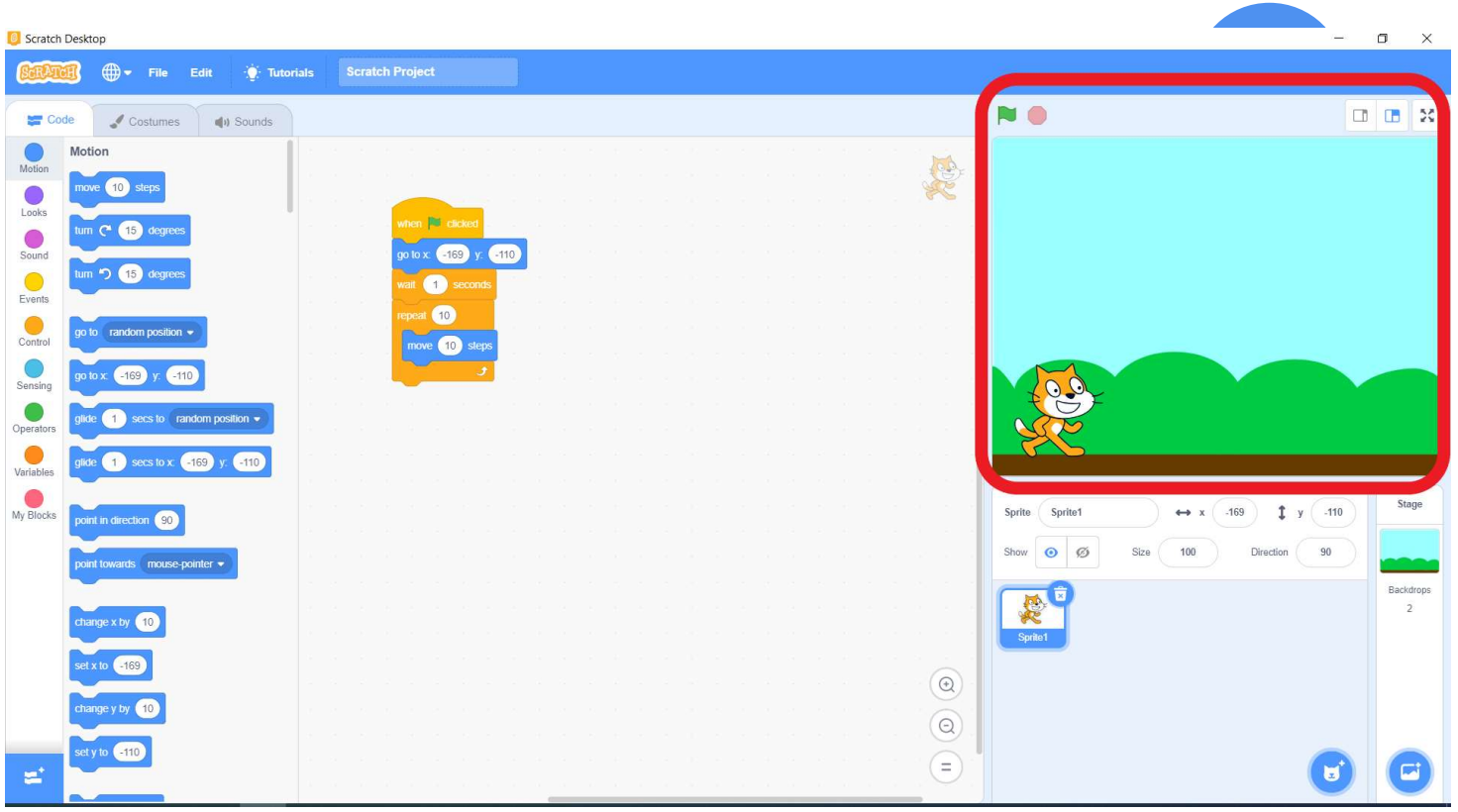
Visual programming environment for the creation of games, activities, interactive lessons.

It can be used both locally and online

https://scratch.mit.edu/

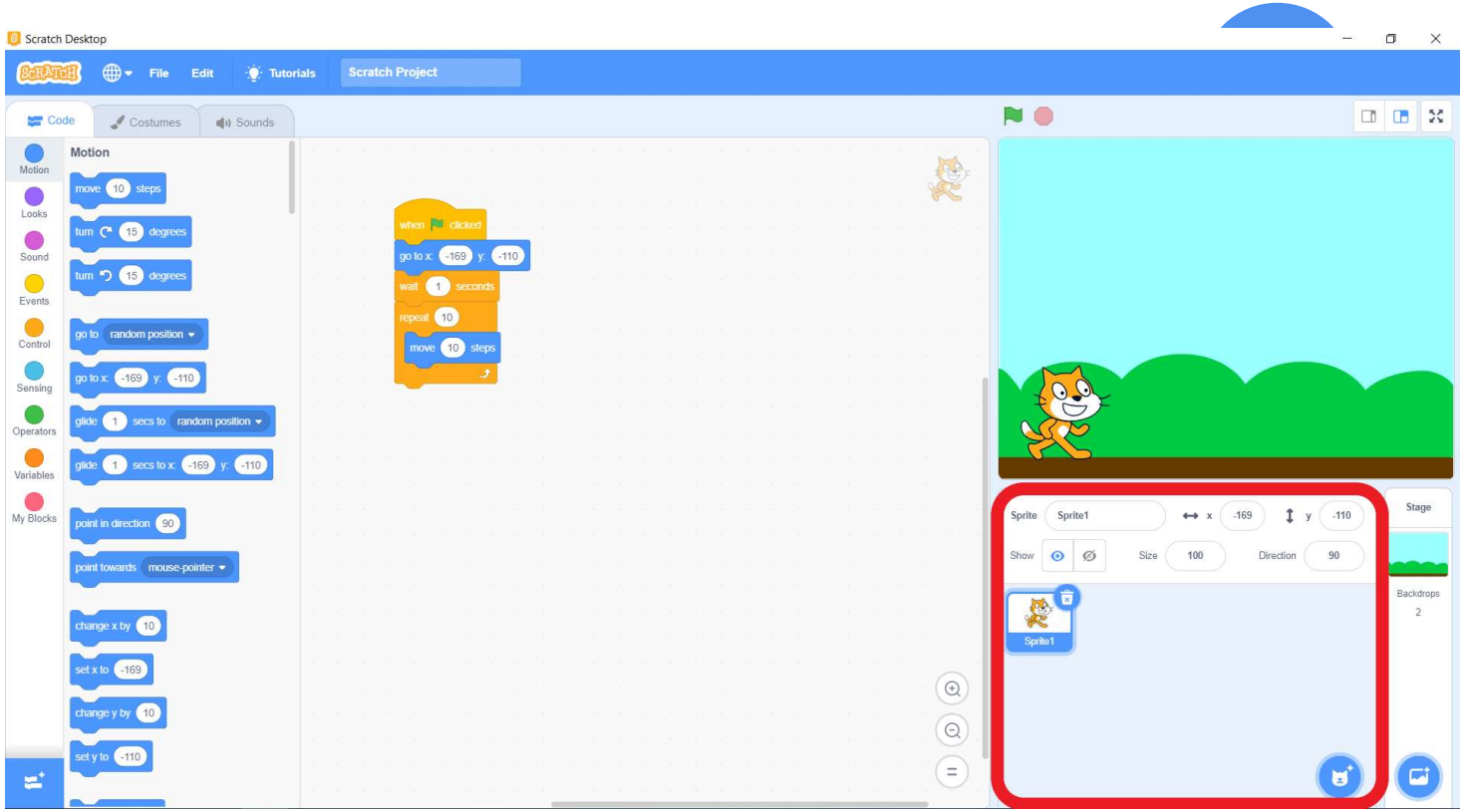
Scratch: Playing Field

- Start
- Stop
- Small size
- Medium size
- Full-screen



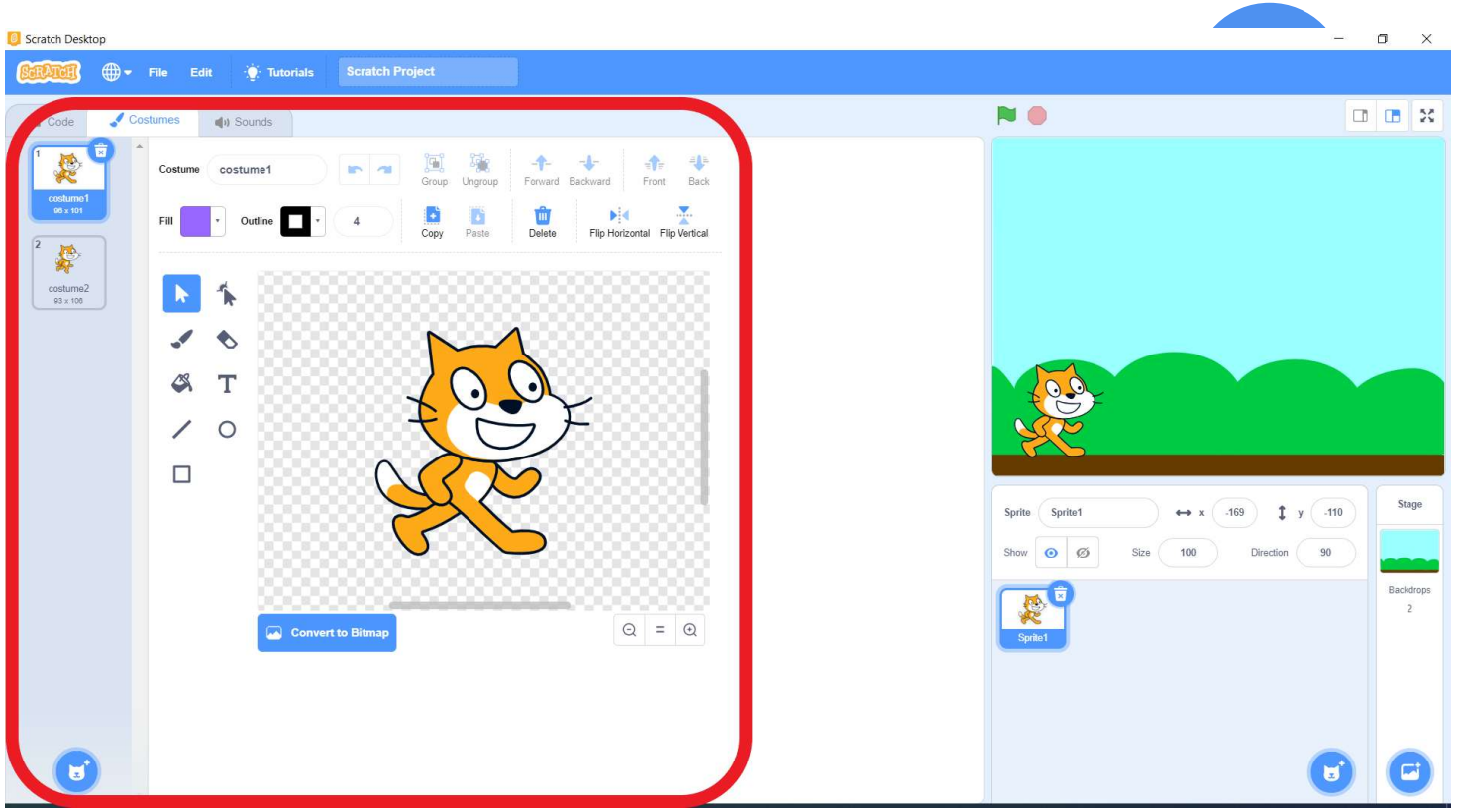
Scratch: Sprite

Characters and / or elements that are inserted in the playing field to carry out actions.



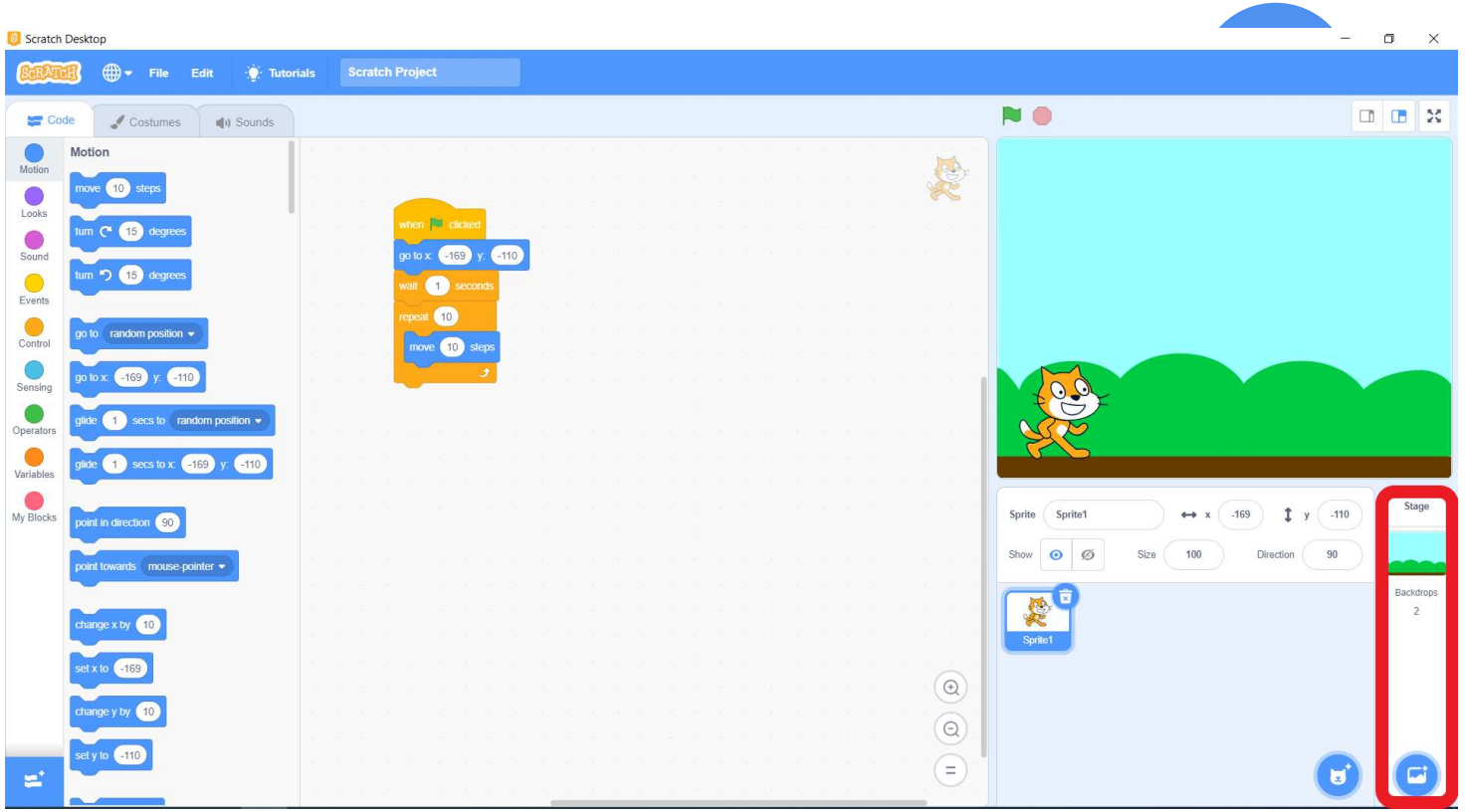
Scratch: Sprite Costumes

It allows you to modify the sprite from a graphic point of view



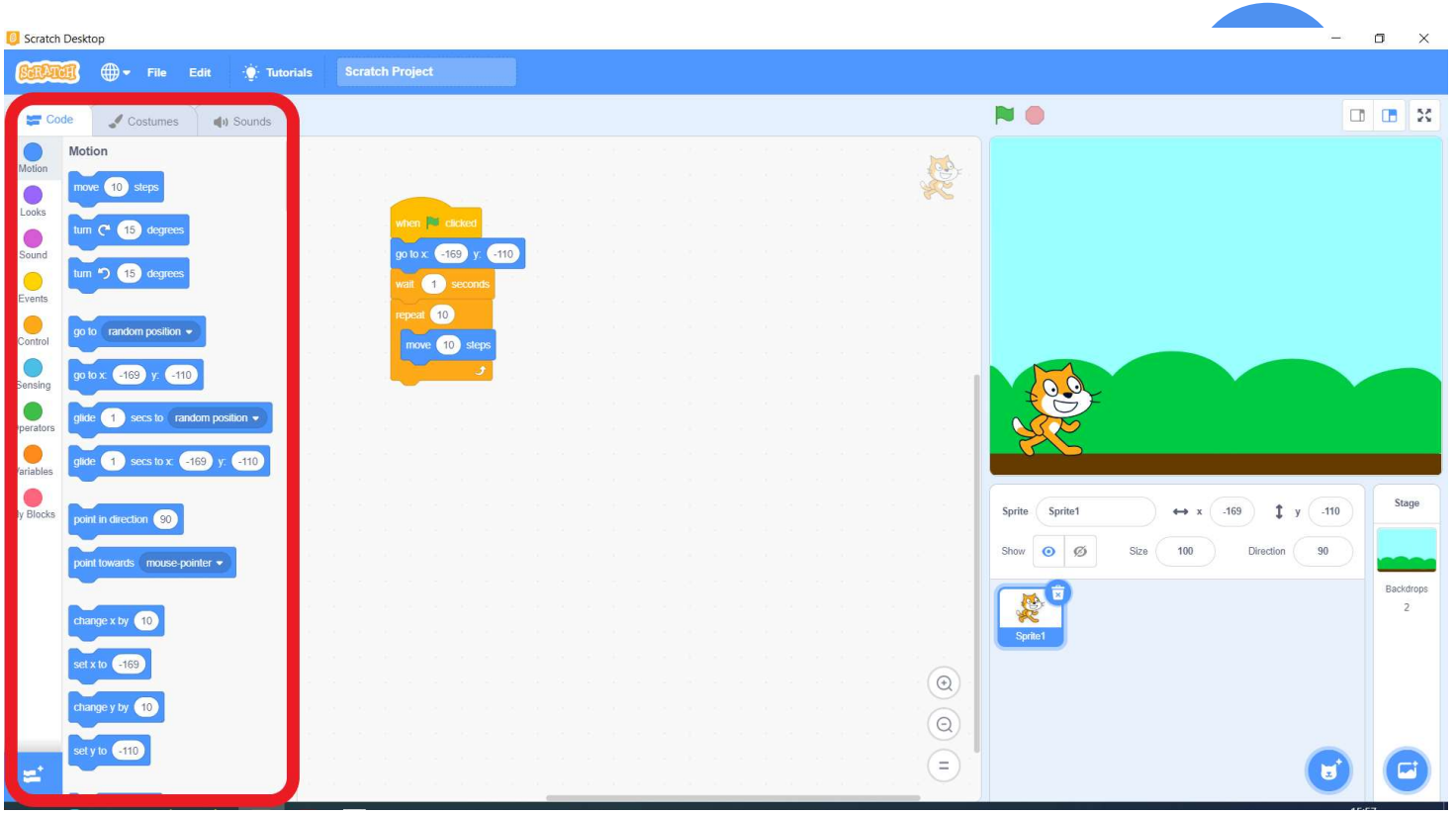
Scratch: Stage

Section that allows you to manage the background



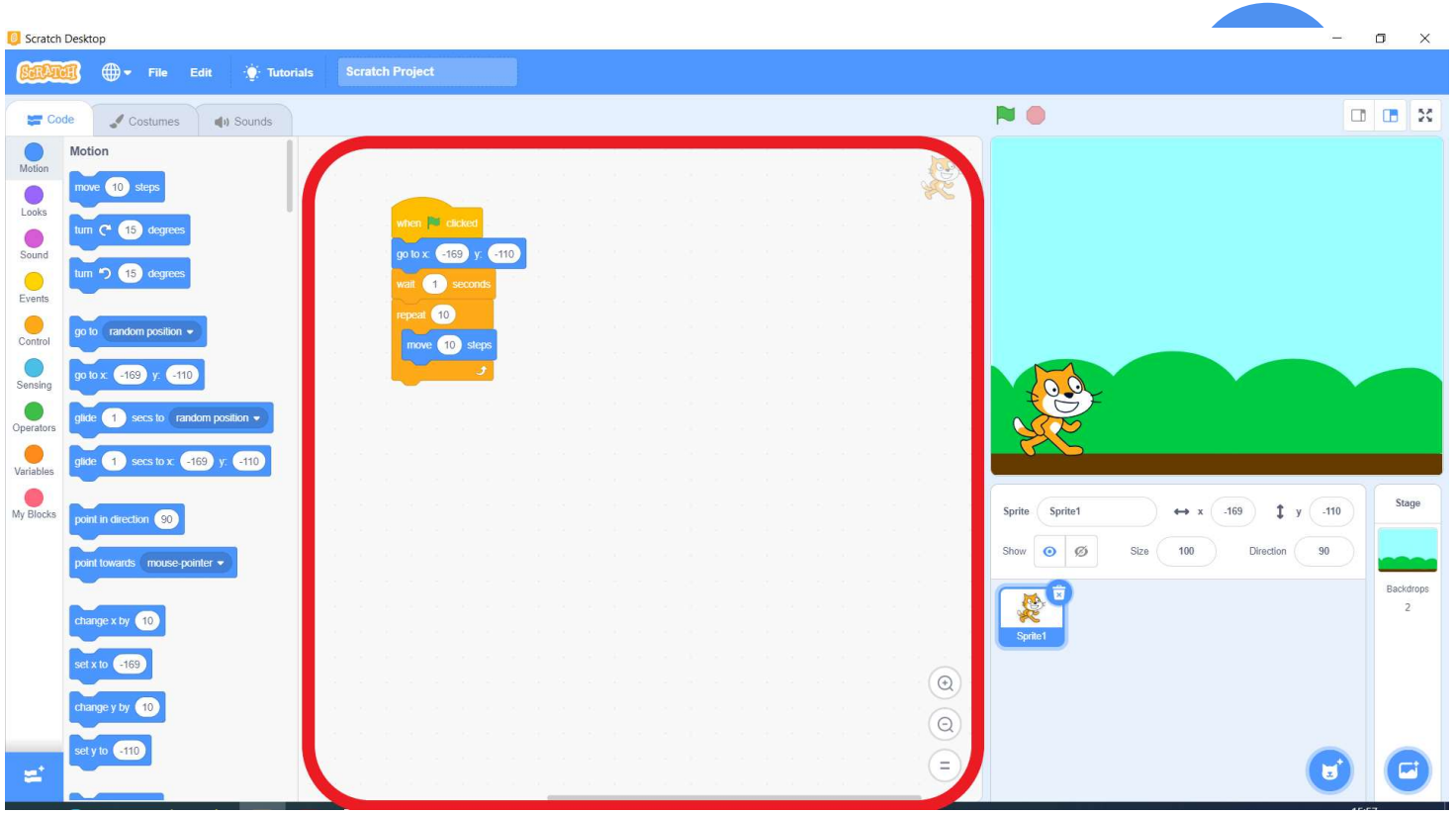
Scratch: Blocks

List of commands that can be assigned to a sprite or to the stage



Scratch: Script Area

Area where commands are inserted that allow the sprites and the background to perform actions



Blocks – Functions

1

MOTION

It allows you to position and move the sprite within the work area.

2

LOOKS

It allows you to change the appearance and let the sprite speak.

3

SOUND

It allows you to introduce sound effects.

4

EVENTS

It allows to start the program according to the different events and manages the messages.

5

CONTROL

It allows you to make loops and insert conditional blocks.

Blocks – Functions

SENSING

It allows you to manage interactions.

OPERATORS

It allows you to perform mathematical and comparison operations.

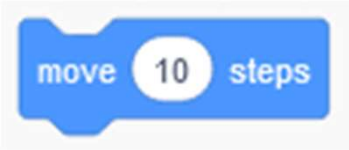
VARIABLES

It allows you to create and manage variables.

PEN

It allows you to draw using sprites.

Blocks – Shapes



Action

Blocks positioned one below the other that are executed sequentially

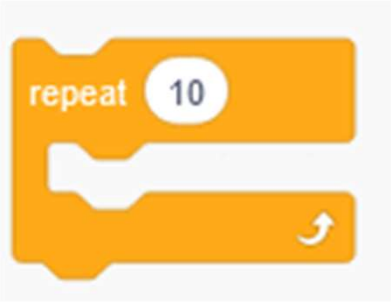
Events

Blocks positioned at the beginning of the script that start the execution

Comparison

Blocks positioned within other compatible blocks (ex. Control blocks) that evaluate a comparison operation with true or false response

Blocks – Shapes

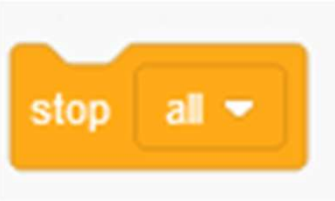


Control

Blocks that enclose other blocks that make up cycles or conditions

Variable and Operation

Blocks containing variables or mathematical operators

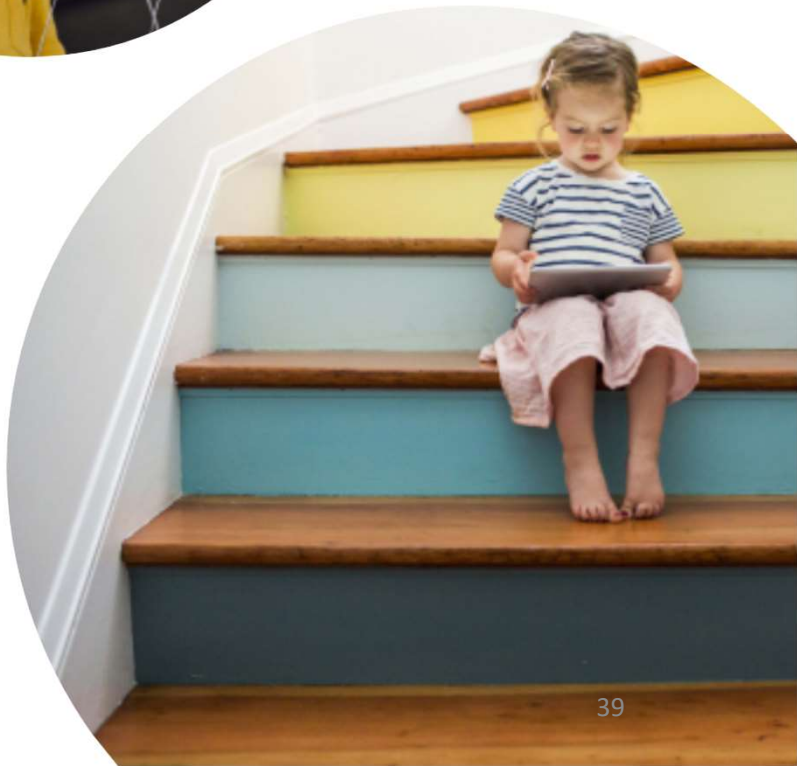


End

End-of-script blocks that kill all active processes

Tutorial 1

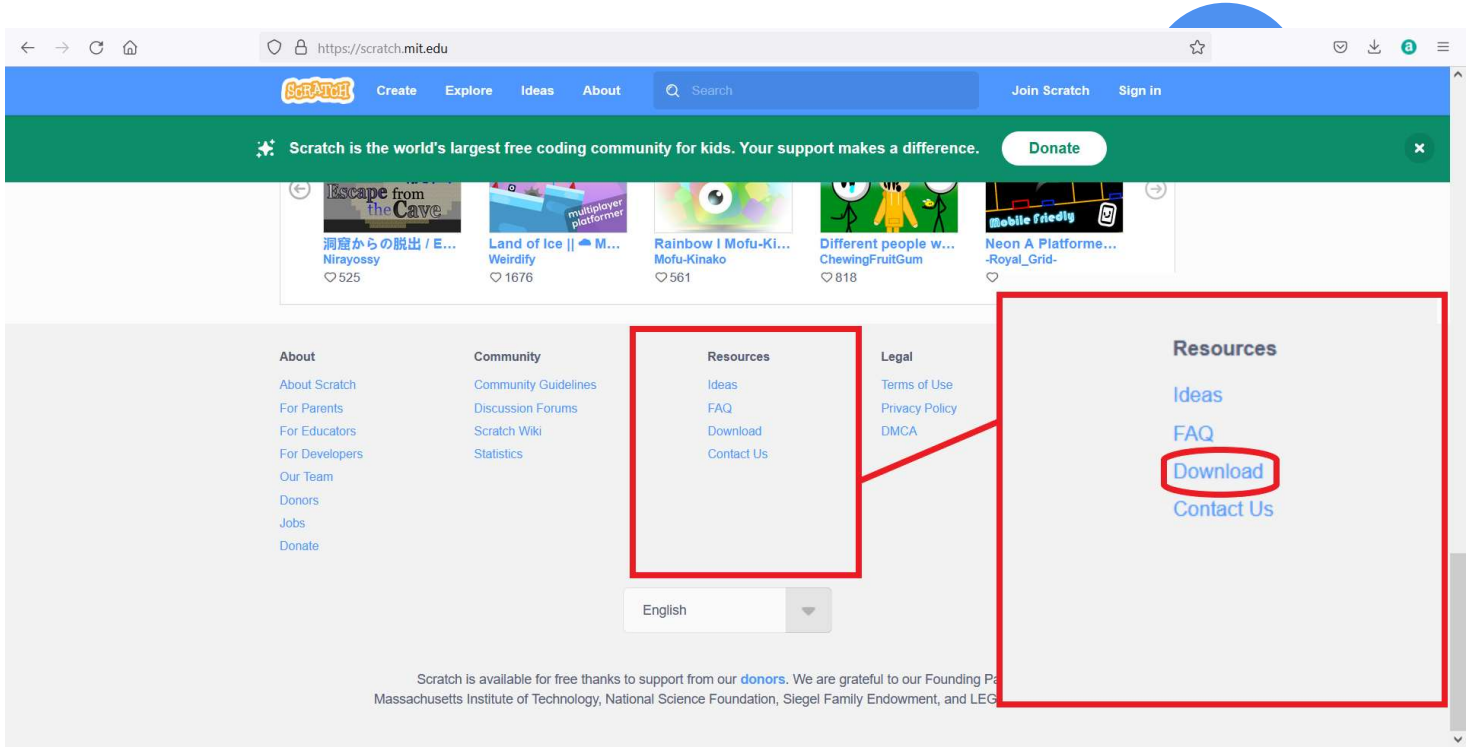
Let's get to know the blocks together



Scratch: download and installation

To download the game from home page click on «Download» and and on the page that opens, choose the operating system and click on «Direct Download»

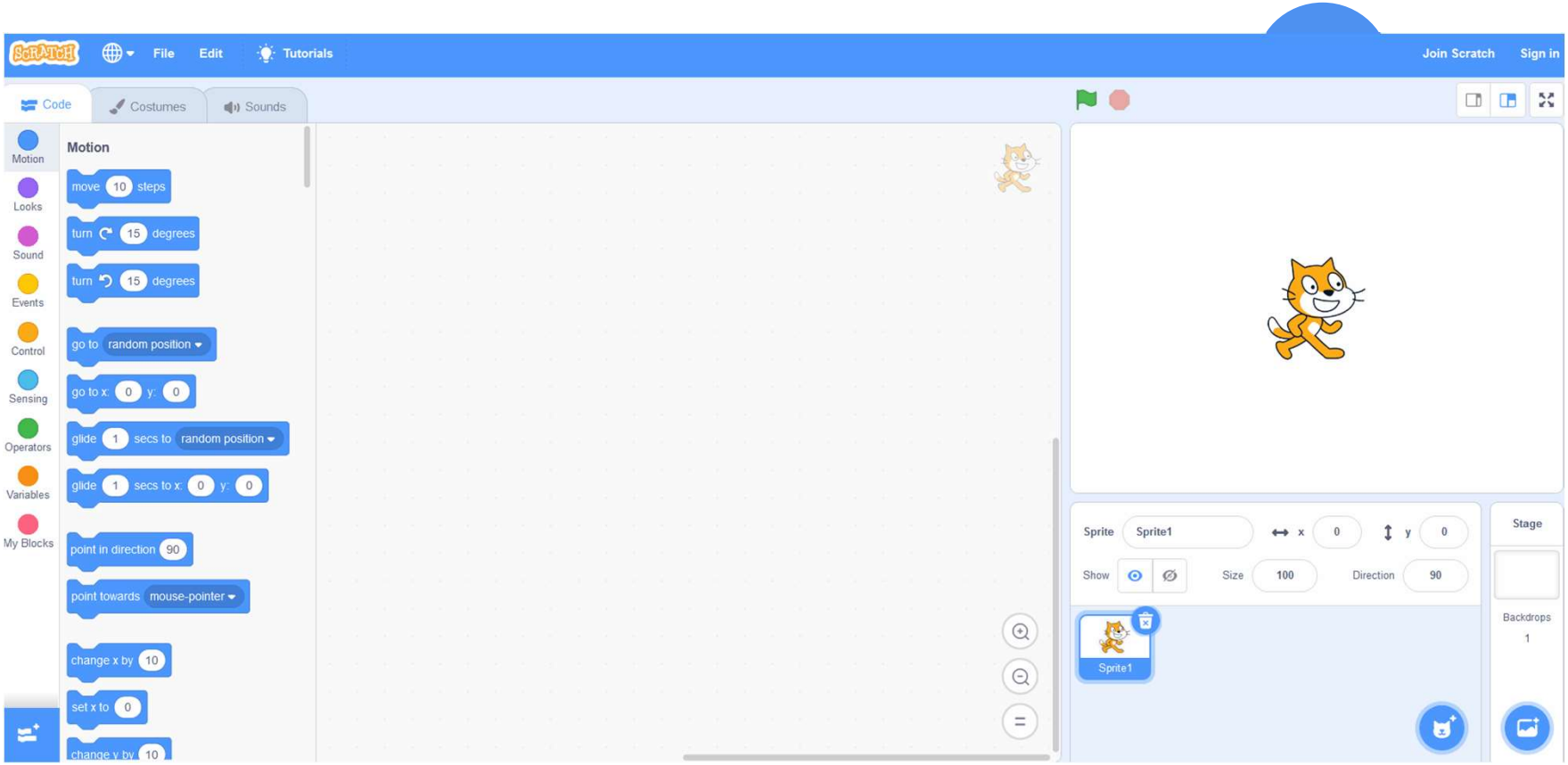
https://scratch.mit.edu/download



Scratch: Move

Use block «Move 10 steps» to move forward the sprite.

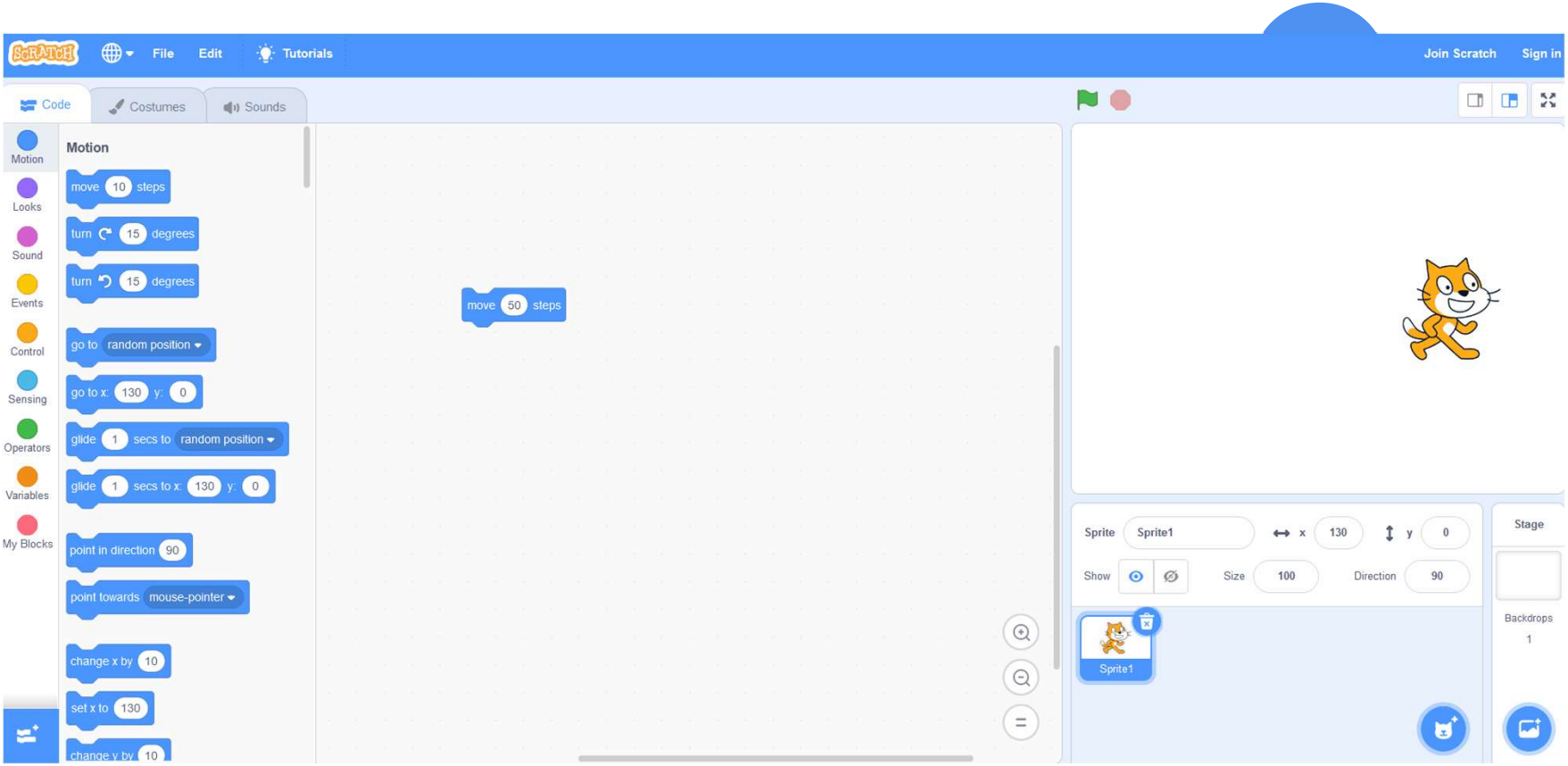
Edit the number in the block to define how far the sprite should move.



Scratch: Go to a given position

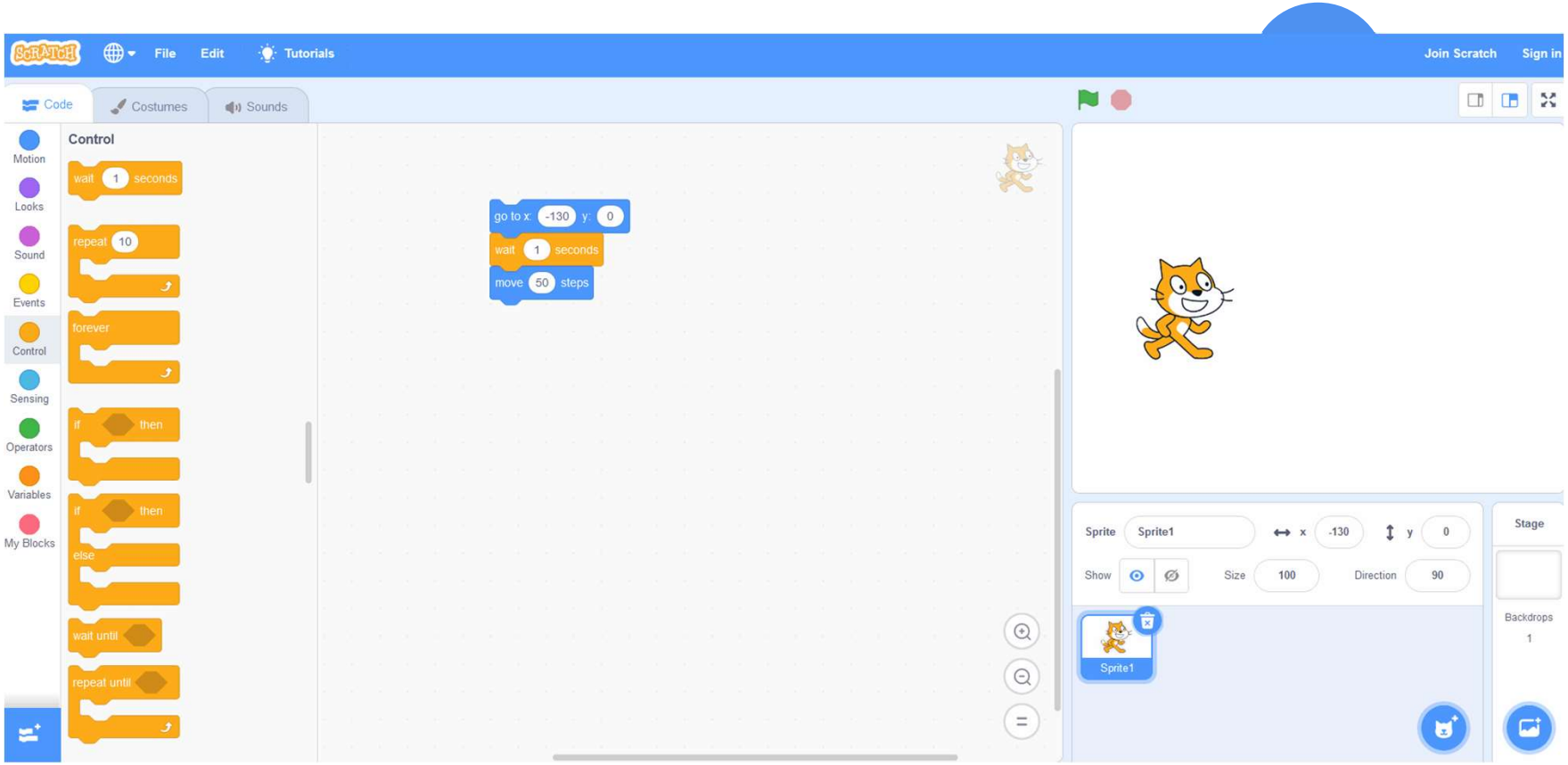
Use block «Go to x… y…» to bring the sprite to a given position.

Edit the coordinates in the block to define where the sprite should go.



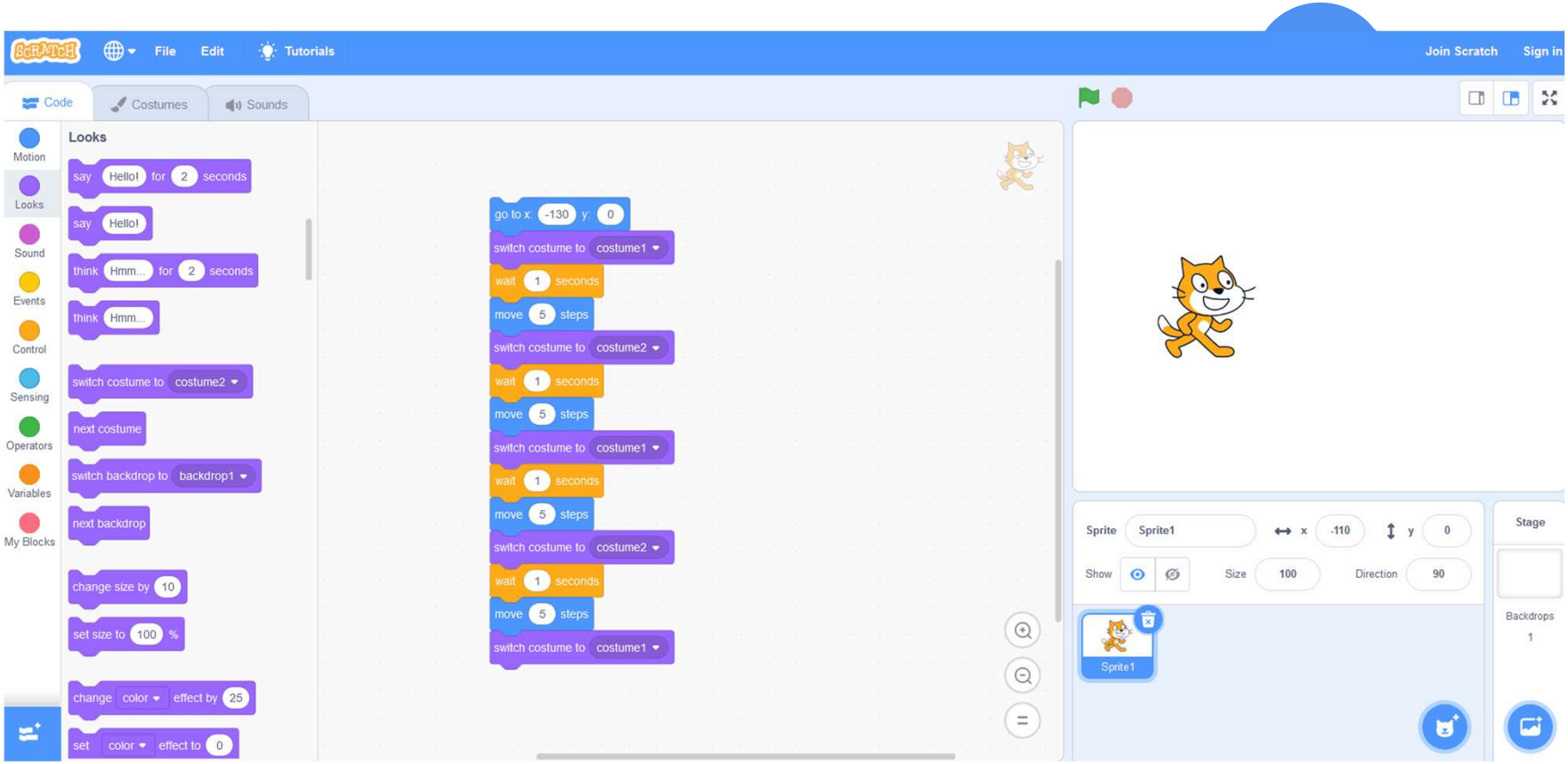
Scratch: Walking

Use blocks «Wait … seconds» and «Switch costume to …» to make moving the sprite more realistic.



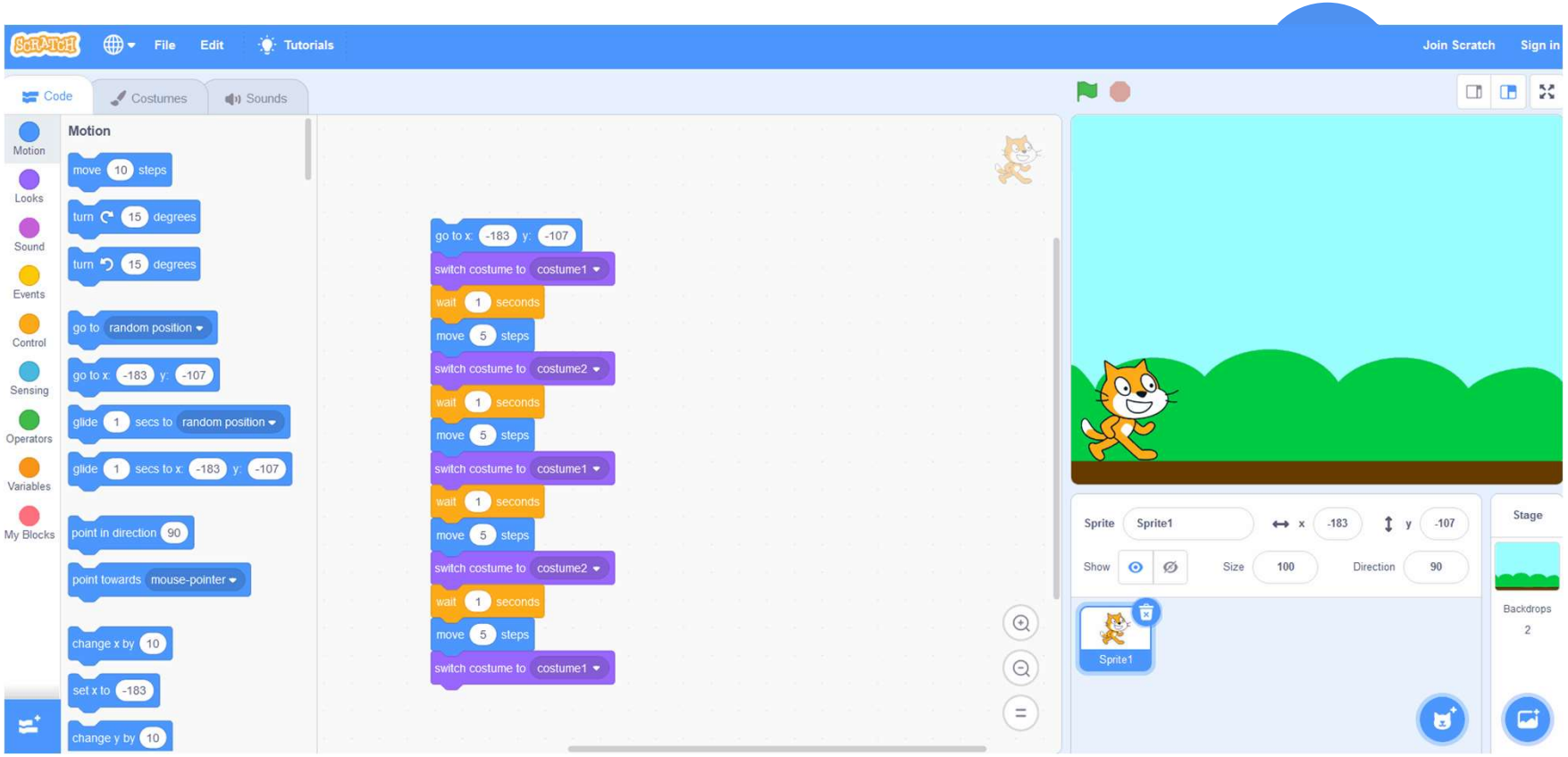
Scratch: Set Background

Choose the Backdrops in the section «Stage» and then use the block «Switch backdrop to …».



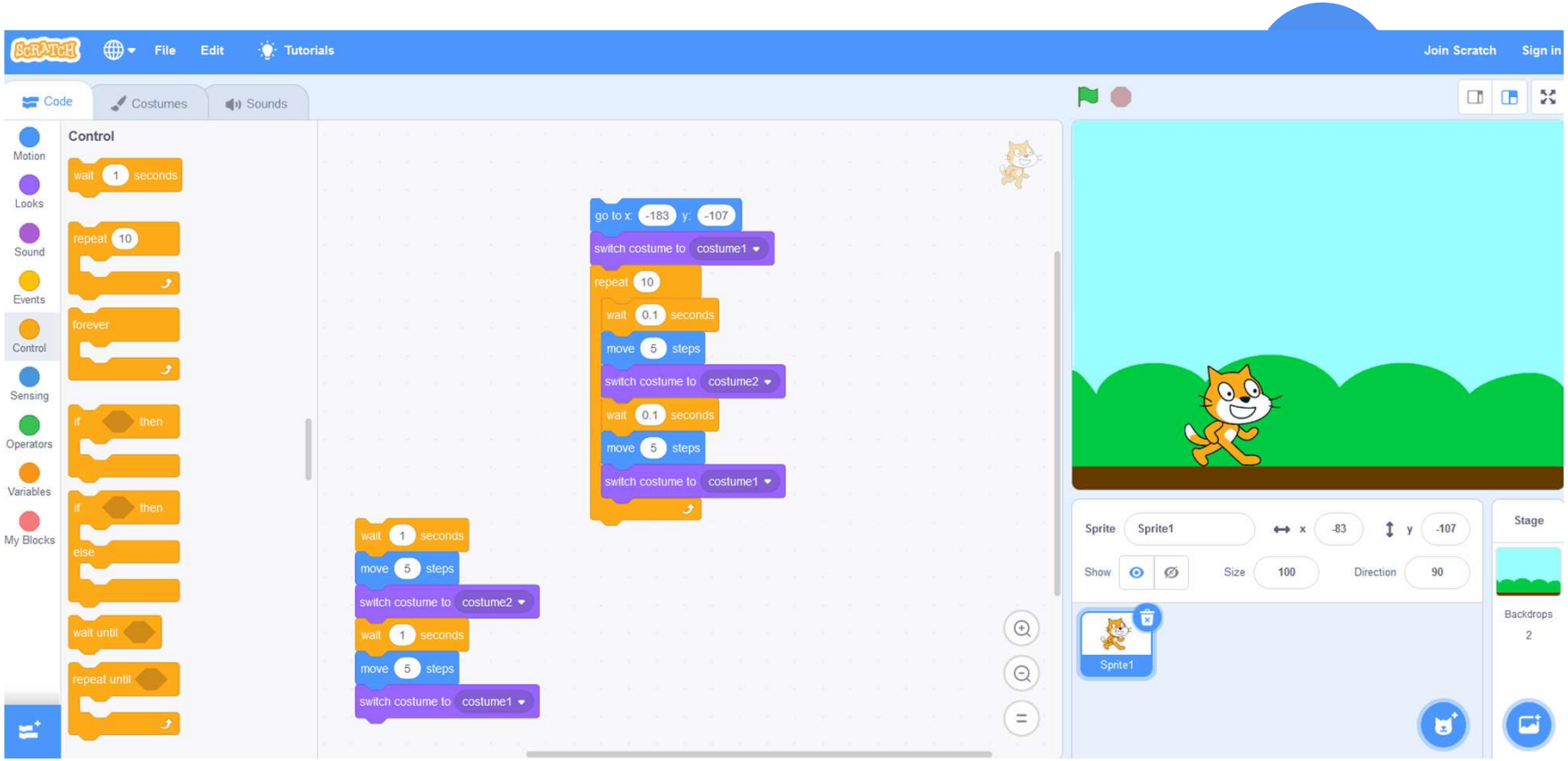
Scratch: Loop

If there are any blocks that repeat several times, use the block «Repeat …».



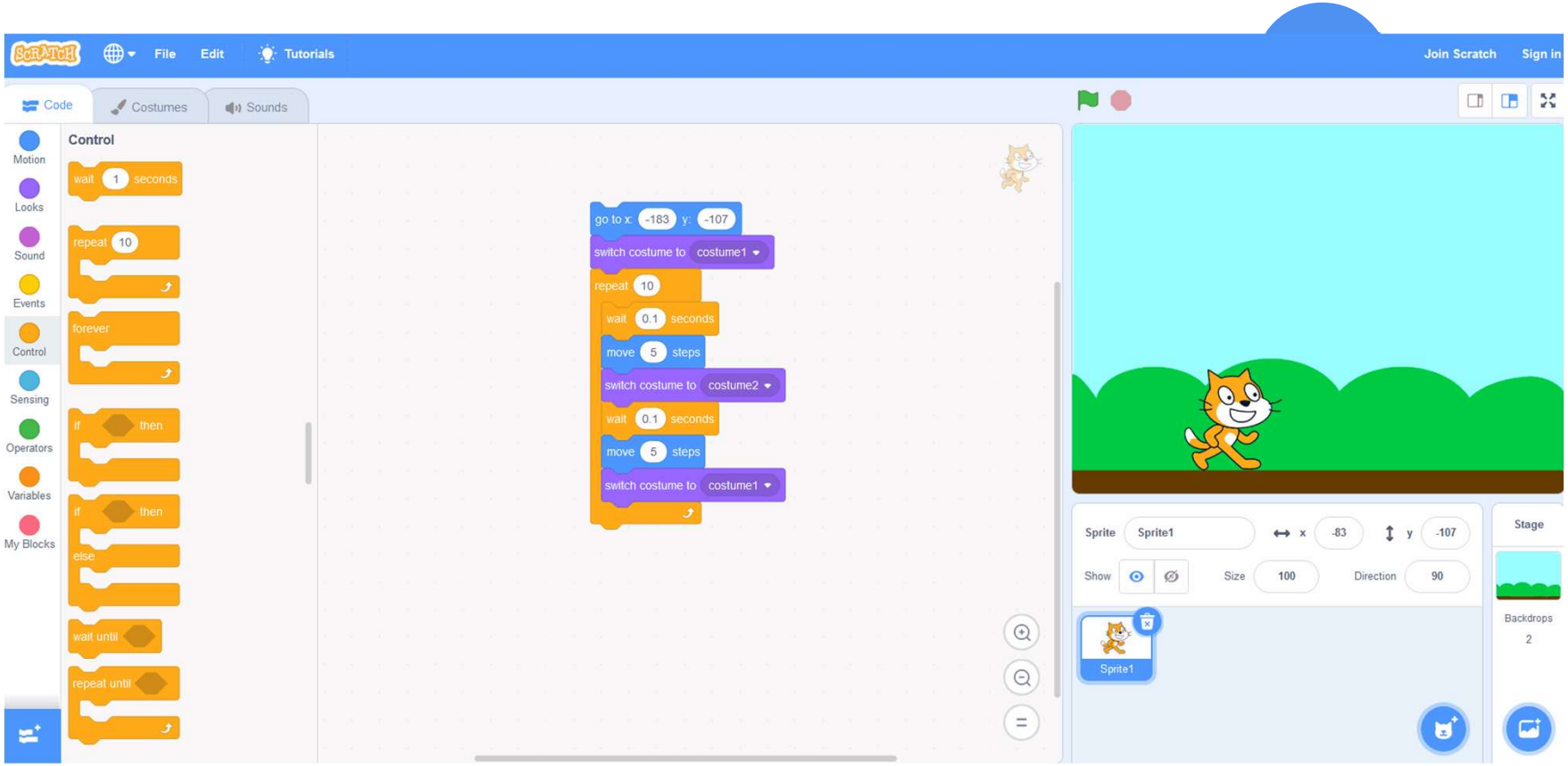
Scratch: Delete blocks

If you need to delete blocks, simply drag them from the work area to the section where the blocks are contained.



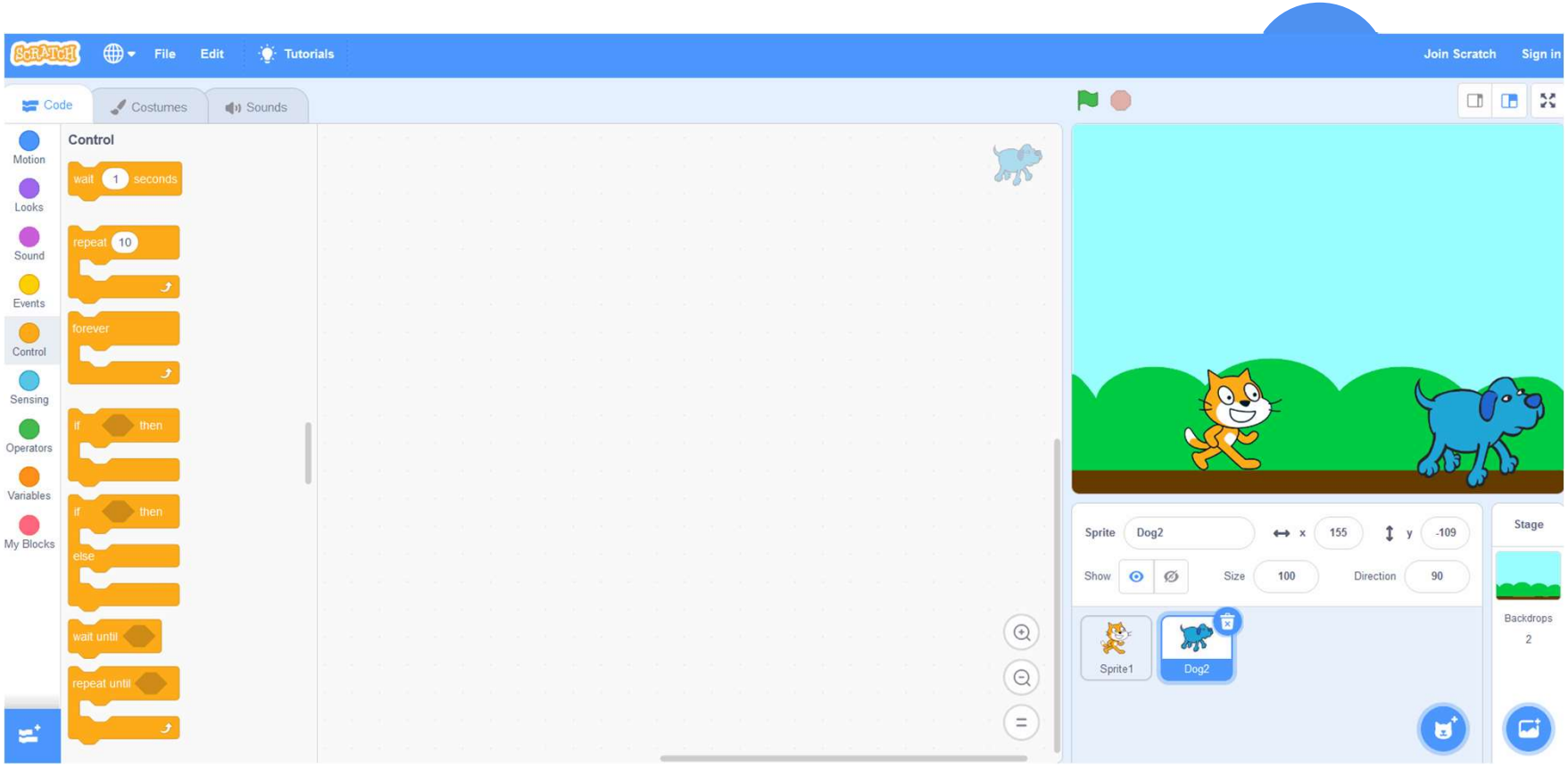
Scratch: New Sprite

To add a new sprite, click the icon in the appropriate section and choose the character.



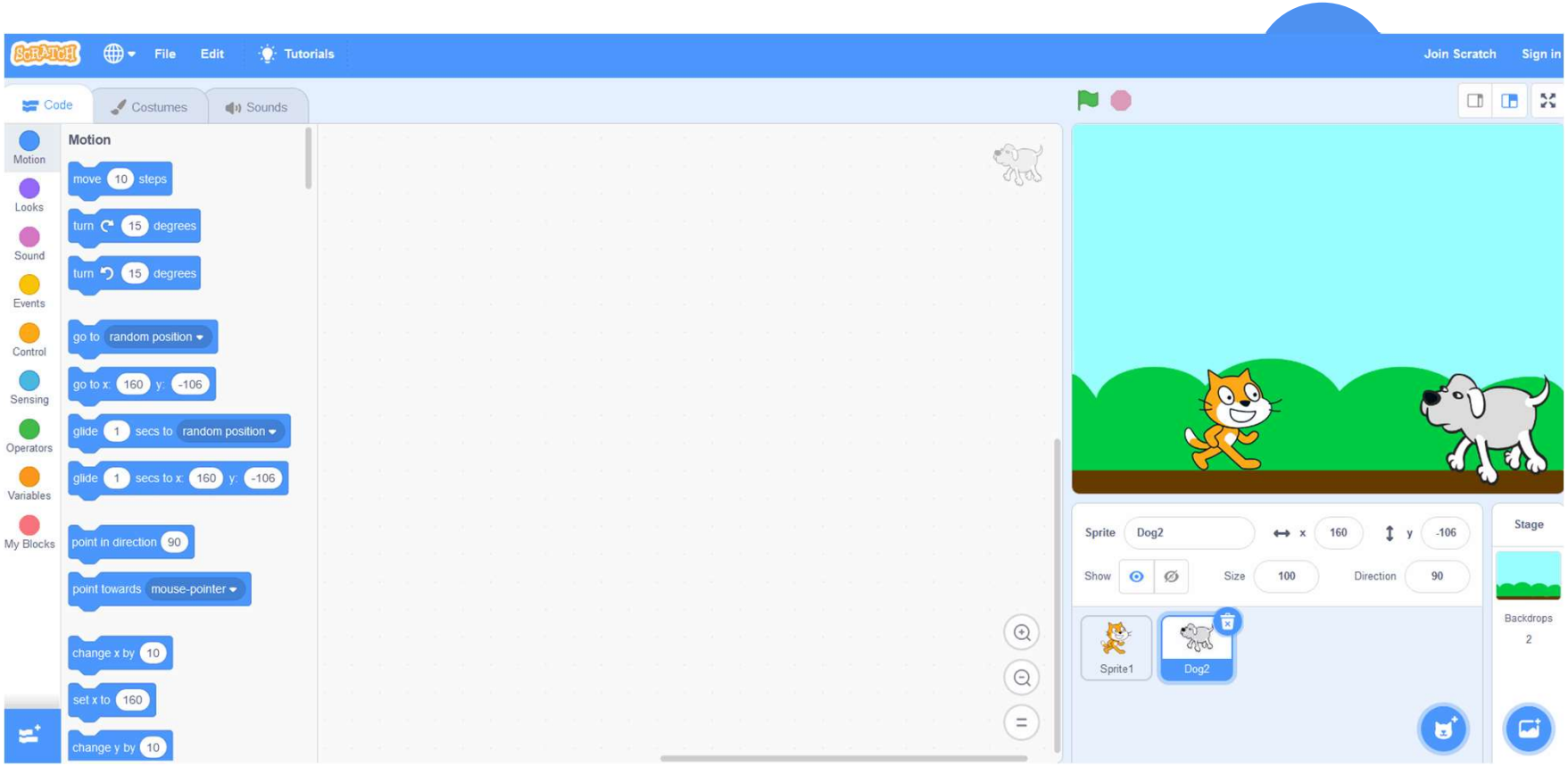
Scratch: Edit sprite costumes

To make graphic changes to a sprite, access the «Costumes» section.



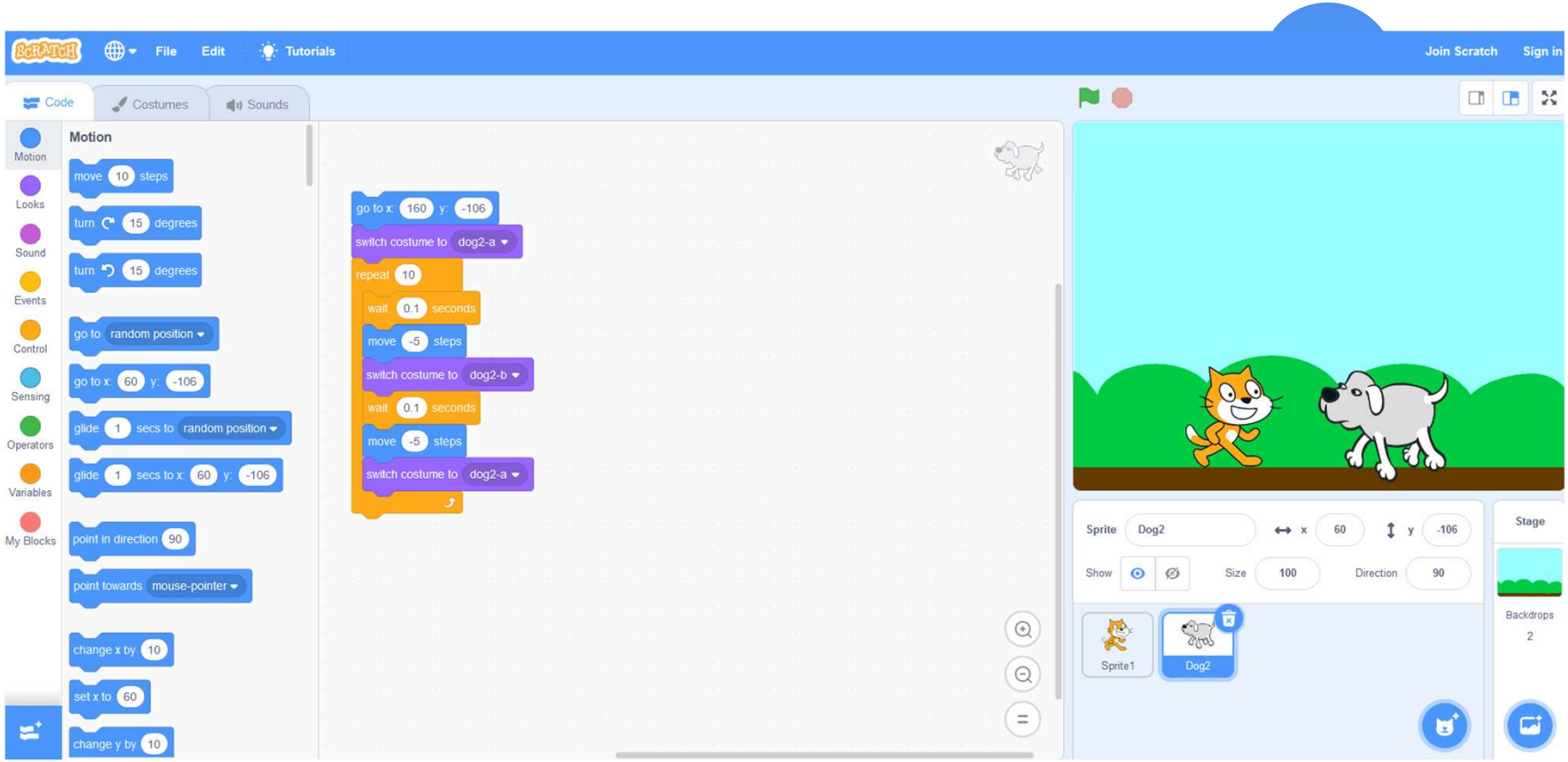
Scratch: Duplicate Script blocks

To copy a block script to another character drag the script over the character in the «Sprite» section.



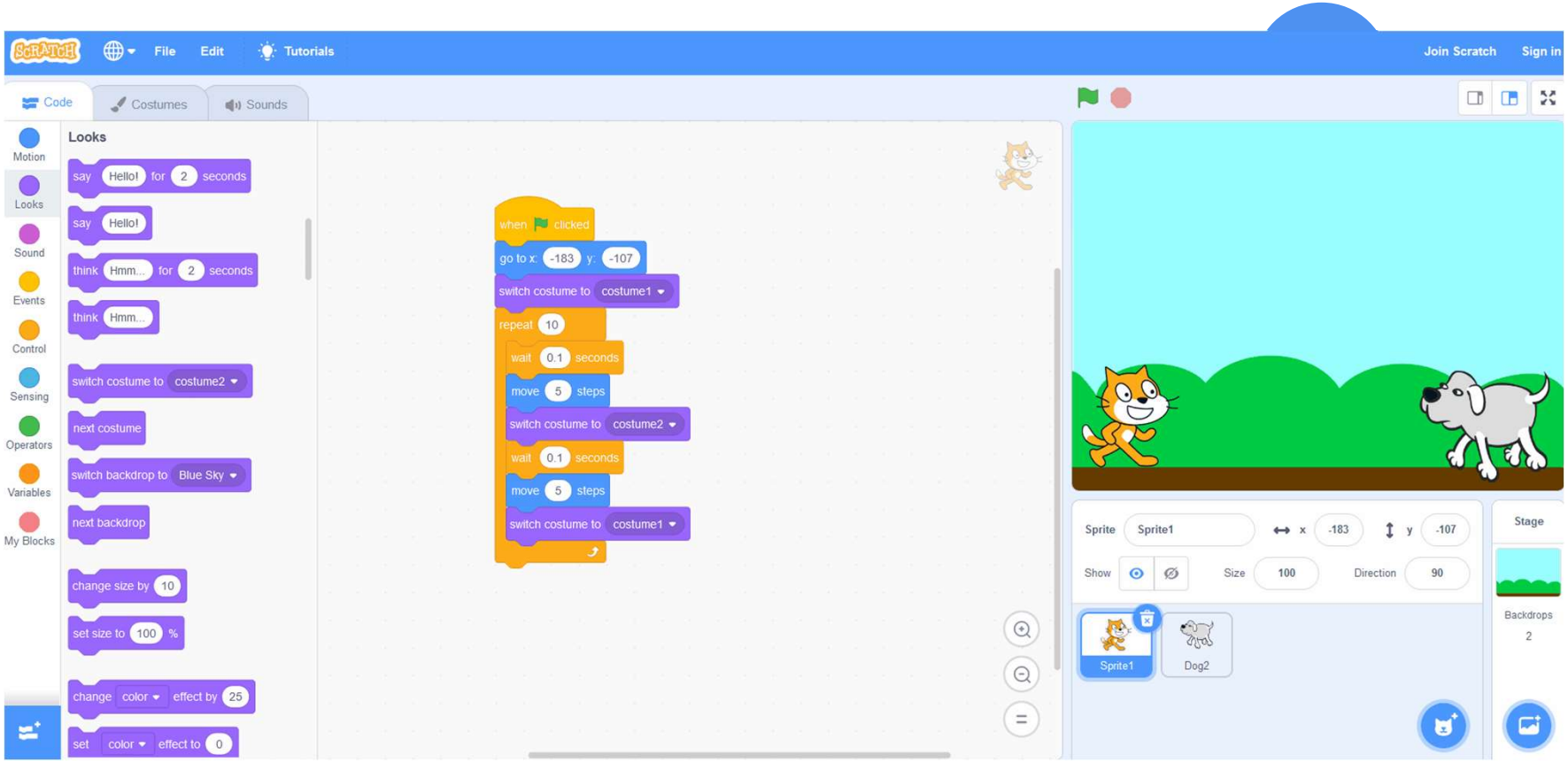
Scratch: Start

Add the "Start" block to all scripts, both sprite and stage.



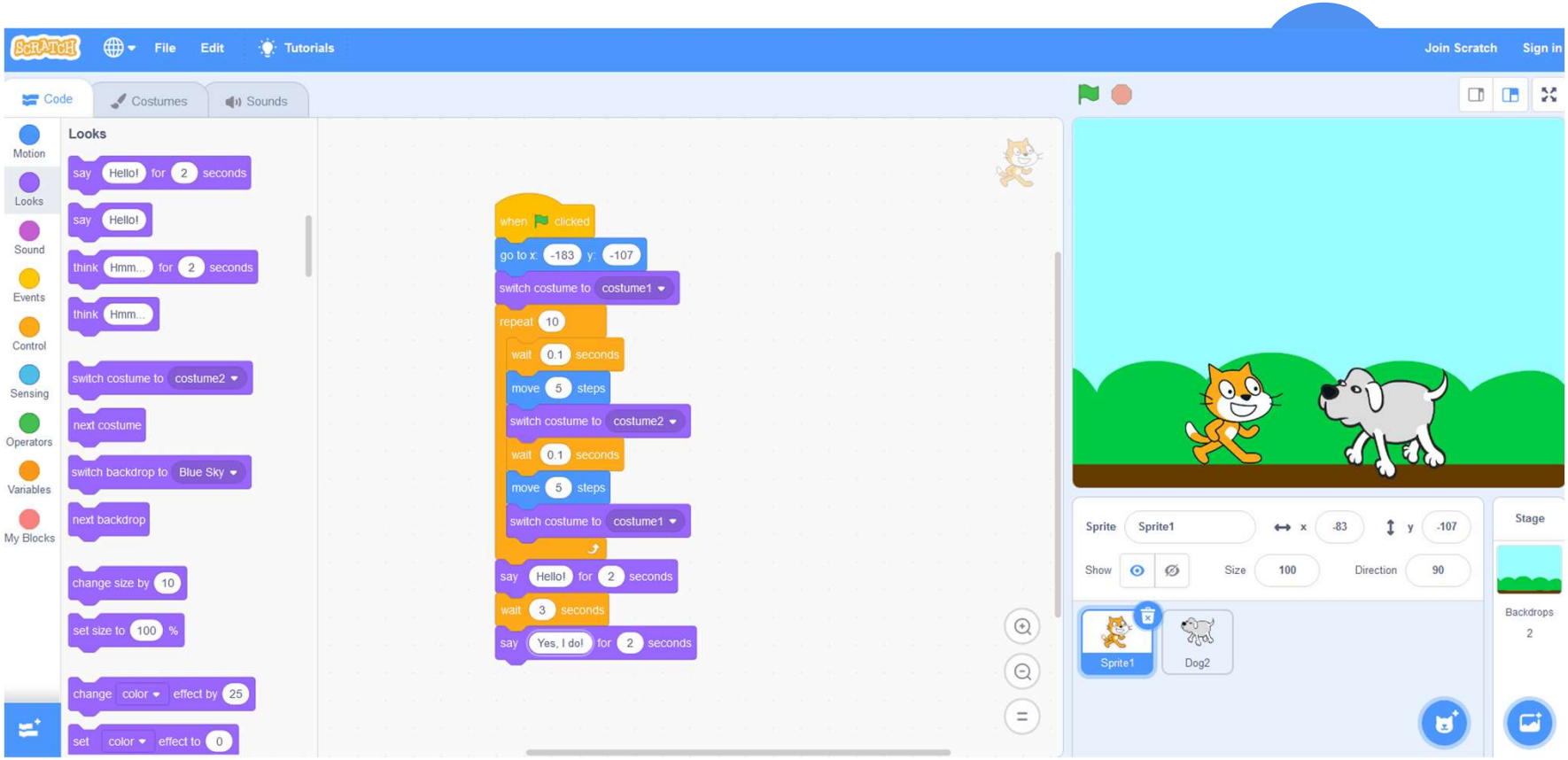
Scratch: Interaction

Get the sprite to talk with the “Say… for… seconds” block.



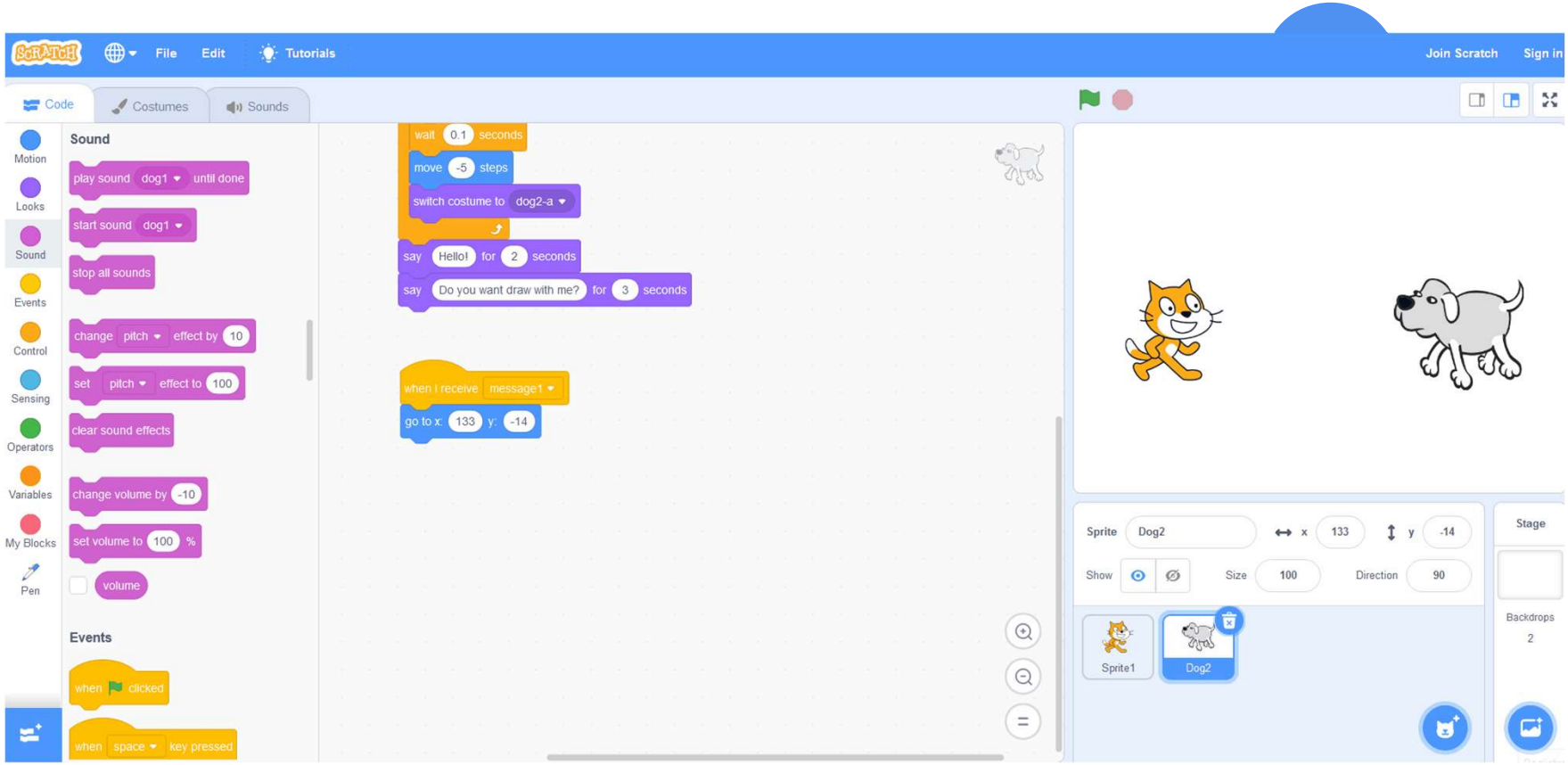
Scratch: Message

Run scripts simultaneously in multiple sprites or stages using messages



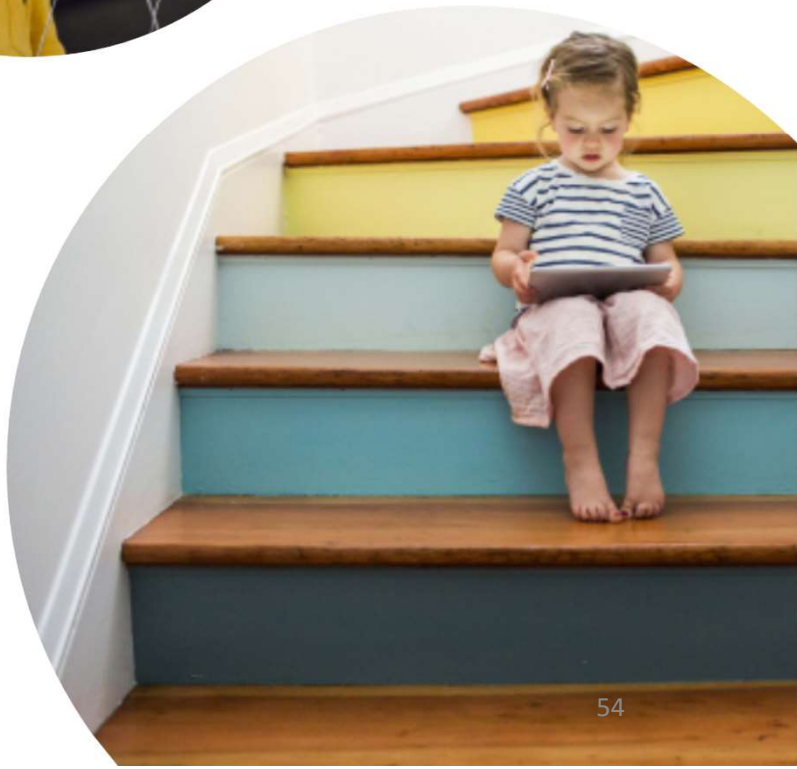
Scratch: Pen

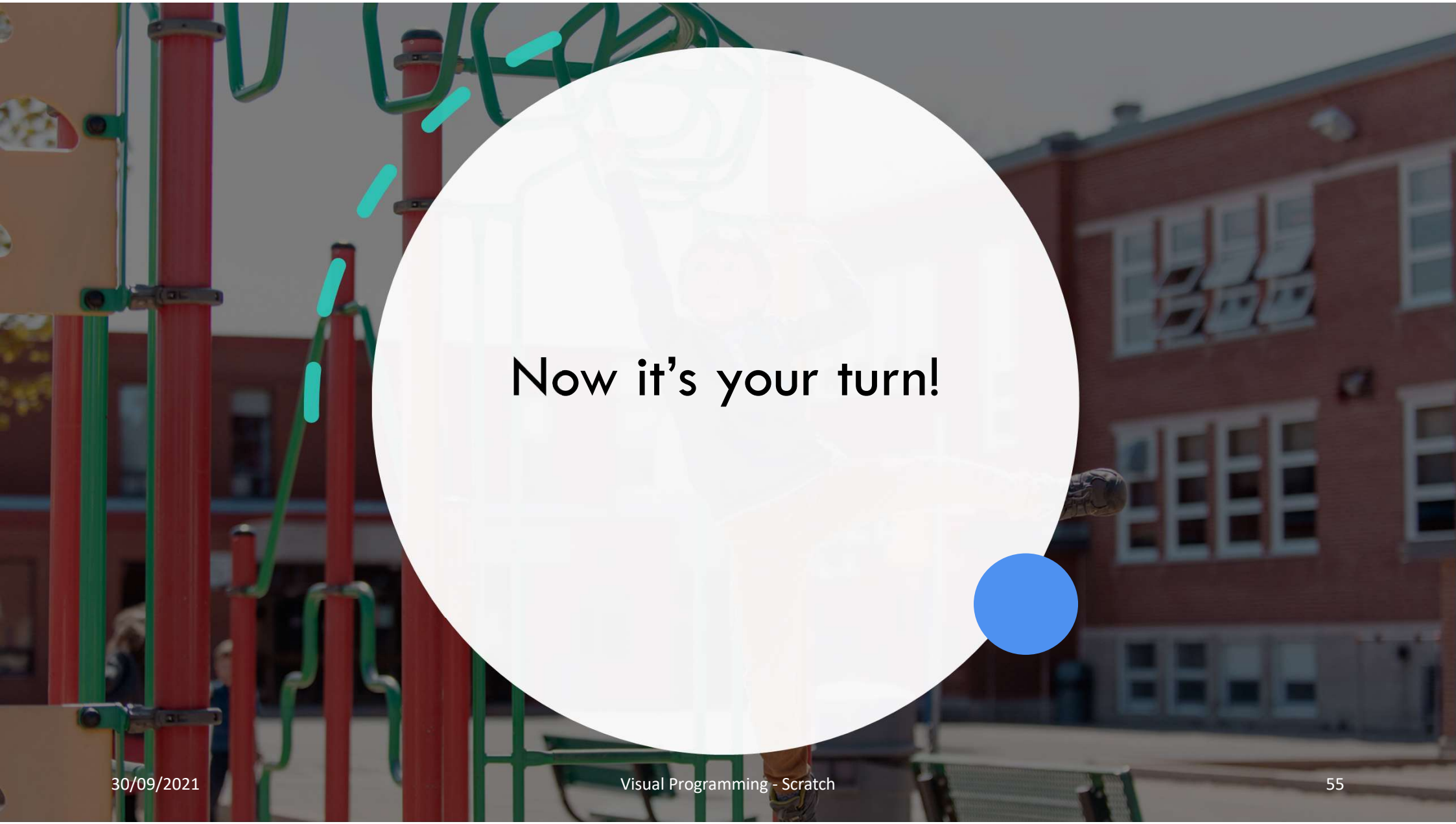
Add the pen extension and have your sprites drawn on the stage!



Tutorial 2

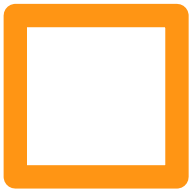
Create a game where there are balloons of different colors moving across the screen. Choose whether to pop them with the click of the mouse or through contact with another character.




Now it’s your turn!

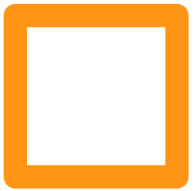
Workshop

Choose two characters and make them dance with music. When they meet on stage make them do something.



Workshop

Create an educational activity using scratch.

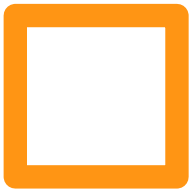


Workshop

Create an educational activity using scratch.

For example:

- explanation of a topic of your choice and subsequent multiple-choice or open-ended test
- finds the initial of the name of the image shown. When pressed correctly you give feedback
- Show items (one by one) from three categories in the center of the screen and ask which of them each item belongs to



Thank you for your attention!

Martina Fortunelli
Jessica Carloni