INTRODUCTION TO PROGRAMMING IN SCRATCH

What is programming?

- Programming is the process of giving a computer instructions to tell it what to do or solve a problem
- These instructions are typically used to solve a problem, or, to make larger problems shorter and easier to solve

What is Scratch?

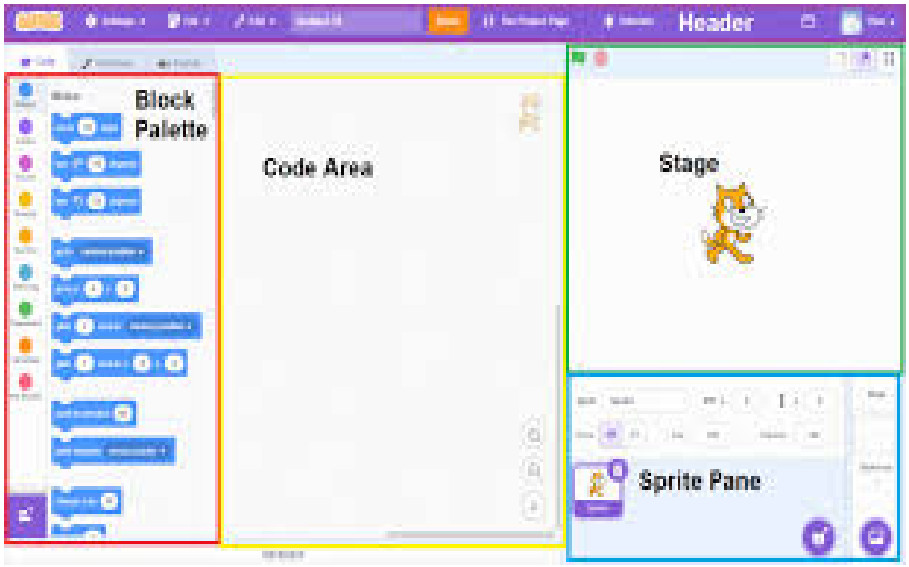
- Scratch is a programming platform designed for beginners, especially students, to create stories, games, and animations.
- It uses a drag-and-drop interface, eliminating the need to write complex code.
- Developed by MIT (Massachusetts Institute of Technology) was developed as a free project by a team of developers at MIT through collaboration with a Canadian firm.
- Scratch is fun and educational and is very easy, including animation and games. It is a very useful tool for young kids or creators to learn and implement coding logic.

Why Learn Scratch?

1. **Encourages Creativity**: Students can design their own characters, backgrounds, and animations.
2. **Builds Problem-Solving Skills**: Scratch teaches logical thinking through step-by-step programming.
3. **Collaborative Learning**: Students can share their projects and learn from each other.
4. **Prepares for Advanced Coding**: Scratch provides a foundation for learning more complex programming languages.

Scratch Interface:

The Scratch interface is the platform where users create and interact with their projects. It is designed to be simple and intuitive, making it suitable for beginners.

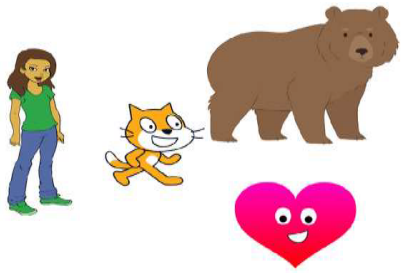


Script:

In Scratch, a script is a set of instructions that are used to create a Scratch program. It is a stack of blocks that are connected with each other and perform the specified tasks. Scripts are used to interact with sprites and tell them what to do or say. It tells the characters what to do or say. Every single sprite is programmed with a script.

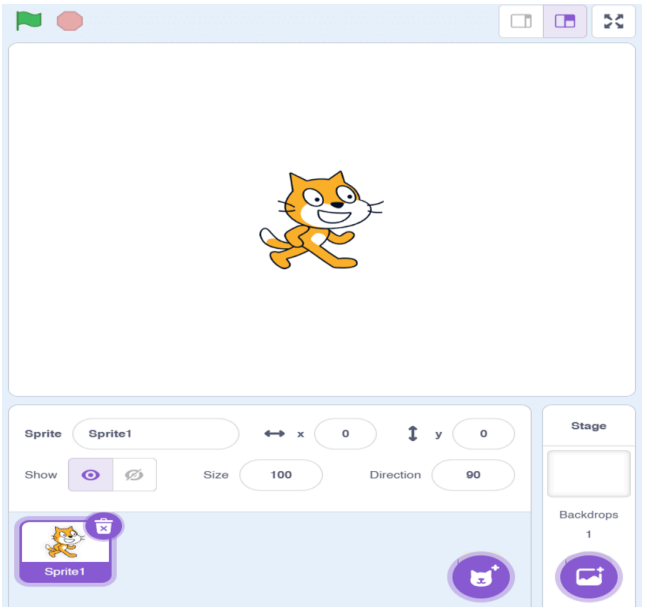
Sprite:

There are objects and characters that could be added to a program to perform actions based on code written in scripts in a project using blocks; these objects and characters are known as Sprite. You can add a prebuilt sprite or create a new sprite as per your requirement. You can find the option to add the sprite in the right bottom corner, second menu from the right corner.



The Stage:

The Stage is the area where your project plays out. It shows what the audience will see when the project runs. The stage size is fixed, and it can display sprites and backgrounds. It uses X and Y coordinates to monitor action with 0, 0 being the stage center

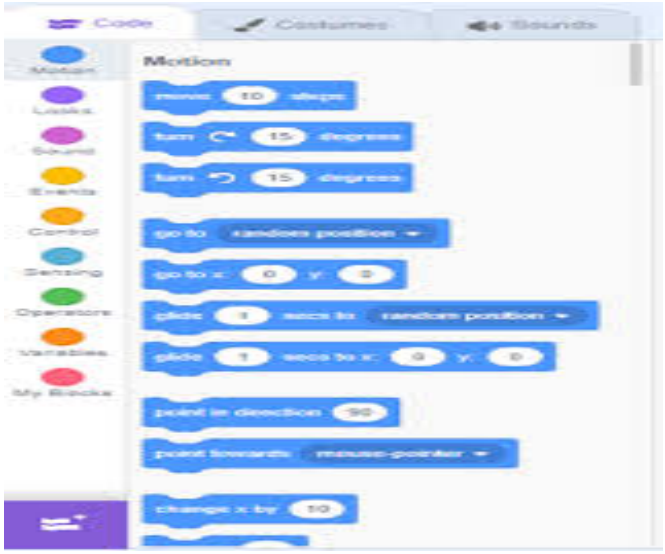


Backdrops

Backdrops are the backgrounds for the stage. You can choose from Scratch's library, draw your own, or upload an image. When you program something in Scratch, you have full freedom to use and change the background, before or during the program.

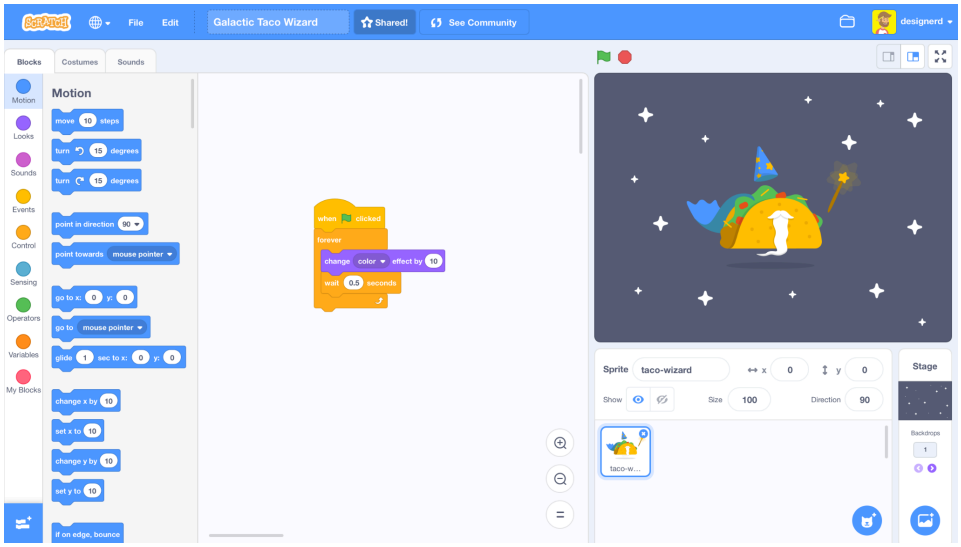
Block Palette

The Block Palette contains all the programming blocks organized into categories like Motion, Looks, Sound, Events, Control, Sensing, Operators, and Variables. These blocks are color-coded to help you find and use them easily.



Toolbar

Located at the top of the interface, it includes options like File (save, load projects), Edit (undo/redo), and access to tutorials.



Green Flag & Stop Button

- The Green Flag starts your project.
- The Stop Button halts the execution of your project.

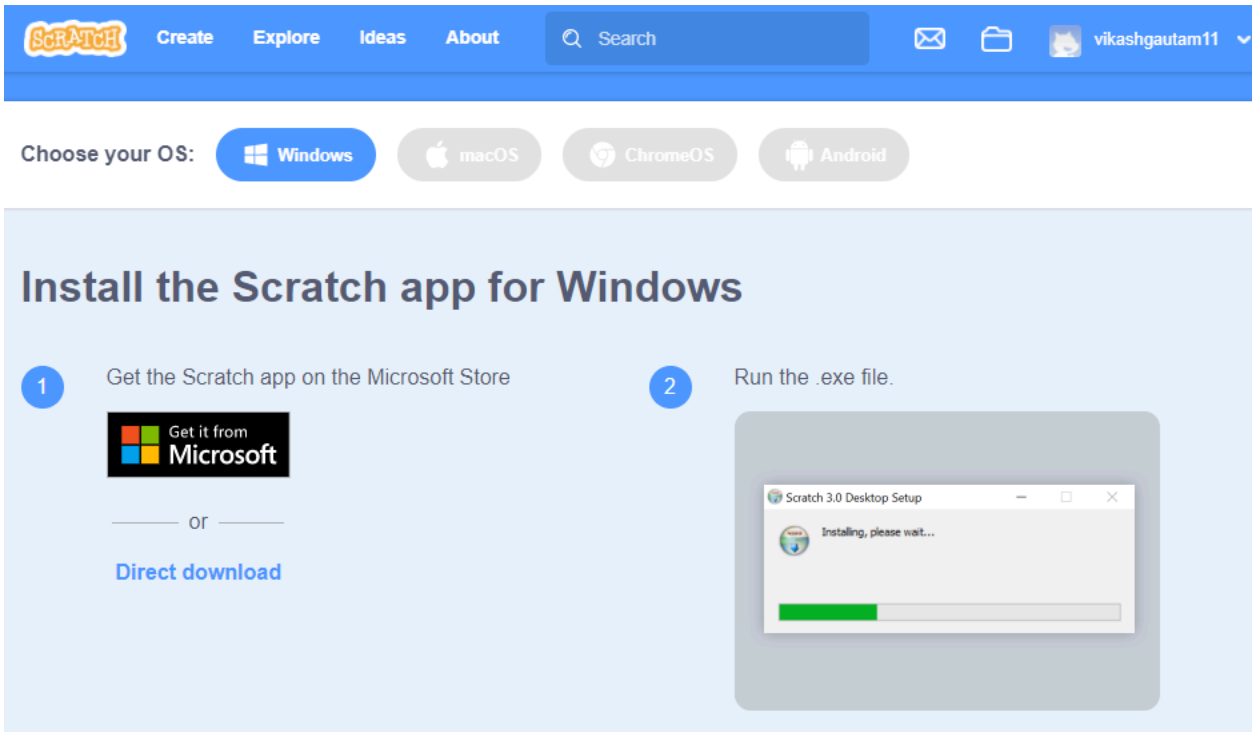
How to download Scratch on your system:

To download Scratch in your system follow the following steps.

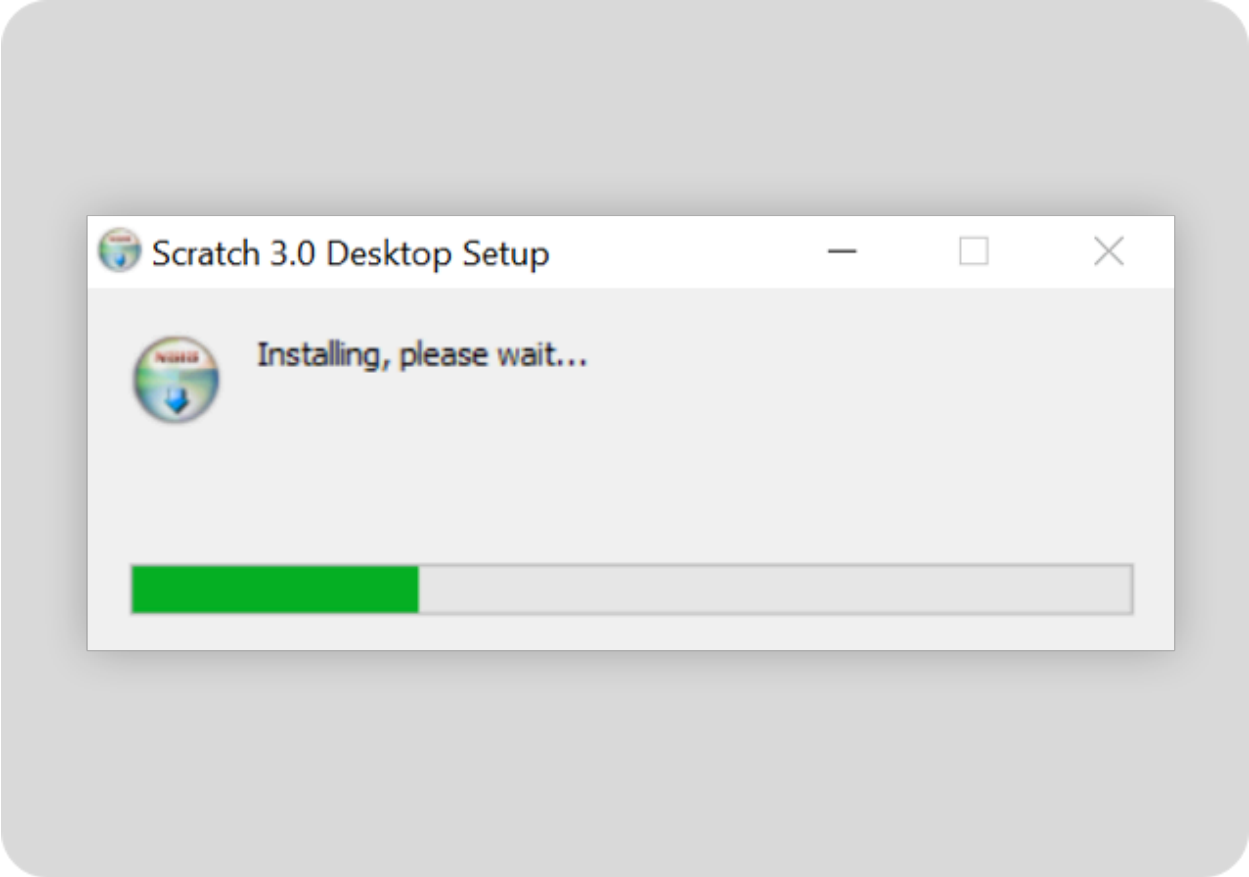
Step 1: Open this link scratch.mit.edu/ in your browser and select your operating system. In this example, we will download Scratch in Windows 10.

Note: Offline Scratch application available in Windows, macOS, Android, and Chrome OS.

Step 2: After the selection of the operating system scroll down and select a downloading option. It is also available on Microsoft Store. Select direct download and downloading will be started.



Step 3: Once downloading will be done double click on the downloaded executable file (.exe) as shown in the image below, double-click.

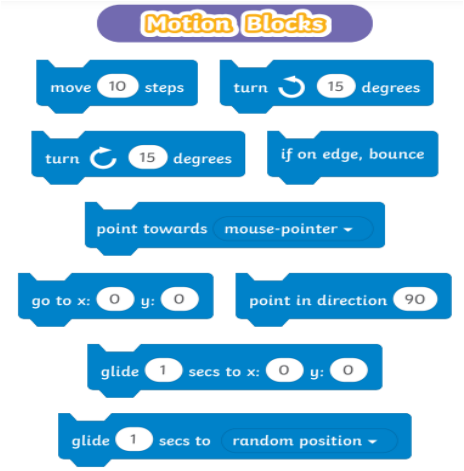


Once the installation process is done, search scratch in your application list and open it.

Types of Blocks

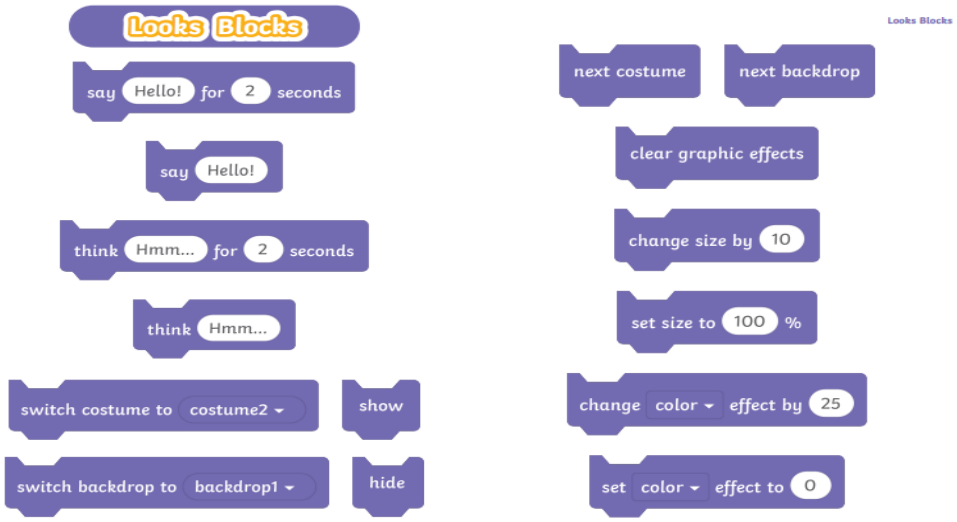
Motion Blocks:

These are used to move a sprite back and forth or in any direction or rotate them.



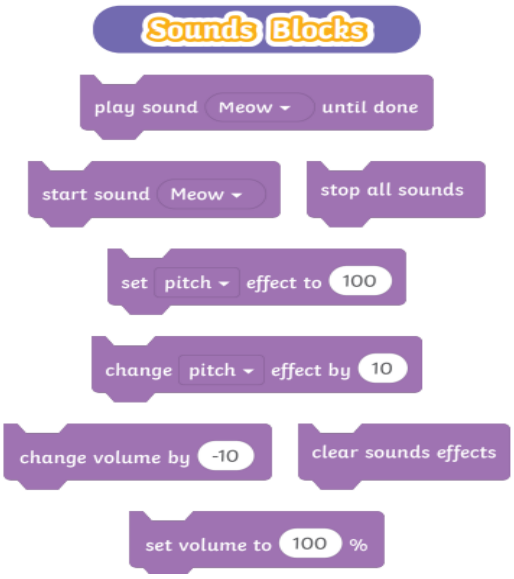
Looks Block:

These are used to change the look of the sprite or replace them with some other sprite of the same category.



Sounds Block:

Add and control sounds in the project.

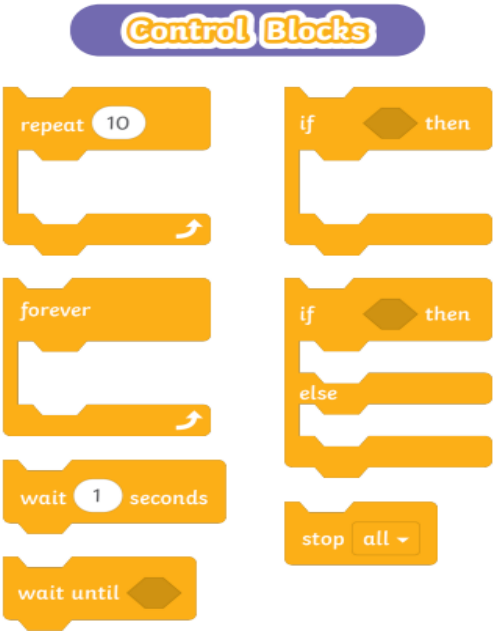


Events Blocks:

Detects and handles events clicks or key presses. These handle trigger calls.

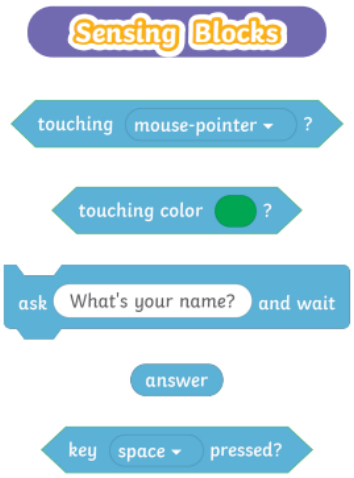
Control Blocks

Manage the flow of the program (loops and conditions). Conditional operators and loops are all in this category.



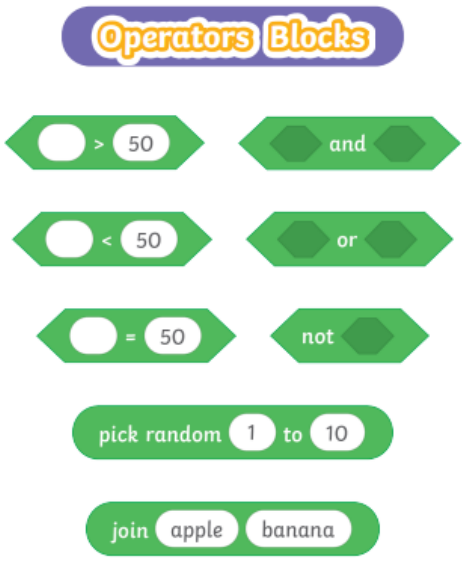
Sensing Blocks

Detect interactions, such as touching, distance, or key presses. controls how to react whenever the mouse pointer hits the playground and/or touches the sprite or by the motion of the mouse.



Operators Blocks

Perform mathematical, string, and logical operations. These are for the control and flow of arithmetic operations in the program.



Variables Blocks

These are used to work with variables. You can declare the variables in your program using these blocks.

My Blocks:
You can create your custom blocks from here.

Loops in Scratch:
Loops in Scratch or any programming language help you execute the same line of code with or without different values for “n” a number of times. You can either set the number of times or set a condition to end the loop.

Scratch Information posters

The Basics


Click here to select a **backdrop**.


Click here to select a **sprite**.

Click on the bin to delete a **sprite** from the **Stage**.


Click here to start and stop a **script** if using the **green flag block**.


Click on the **Add Extension** icon to add the **Pen Extension** to draw on the **Stage**.

Block Categories

Motion	Control the place, movement, direction and rotation of a sprite.
Looks	Control how a sprite or backdrop looks and display text.
Sound	Select sounds and control their volume and pitch.
Events	Control how a script is triggered.
Control	Control the action of a sprite, including loops and waits.
Sensing	Detect the position of the mouse cursor and other sprites.
Operators	Perform mathematical calculations.
Variables	Store data in Scratch's memory.

Loops

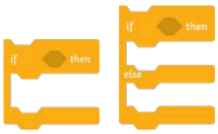
A loop is a tool to repeat an action. There are three types of loops in Scratch, these include:

- count-controlled **repeat** loop;
- **repeat until** loop
- **forever** loop

They are found in the **Control** category.

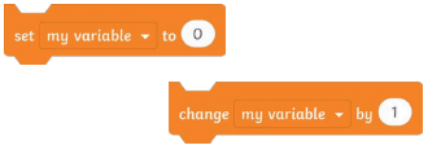
Conditions

The **if... then** and **if... then... else** **blocks** are Boolean logic **blocks**. They control how a **sprite** behaves in response to its environment. They make one set of code run if a condition is true and another set of code run if a condition is false.



Variables

A **variable** is a changeable value that is recorded in Scratch's memory. **Variable blocks** can be used to create or change a score in a game. In Scratch, a user can make new **variables**.



Key Vocabulary

algorithm	An algorithm is a set of sequenced instructions or rules for solving a problem or completing a task in a logical order.
animate	To bring something to life through interactive features, such as moving objects, sounds and buttons.
debug	To find, remove or correct errors in a computer program.
iteration	To repeat a process. For example, an algorithm with an iteration for making a cake would be: 1. Put flour and butter into a bowl. 2. Whisk until smooth. 3. Add sugar and eggs into the bowl. 4. Repeat step 2 until smooth. ⟵ 5. Spoon mixture into cake tin. 6. Bake until golden brown.
broadcast	This block sends out a message, like shouting out a signal. This is done in the middle or at the end of an algorithm.
deconstruct	Breaking down existing algorithms into smaller parts to see what they want to do.
sequence	The order in which a set of instructions are performed or carried out.
when I receive	This block listens out for the broadcast signal being shouted out and can then, when it is heard, trigger an event. This is used at the beginning of an algorithm.

What Is an Algorithm?

Algorithms on a computer are exactly the same as everyday algorithms. They are a set of sequenced instructions or rules for solving a problem or completing a task in a logical order.

Computers need to have their instructions written in a special language called a programming language. We sometimes call this computer code.

There are lots of different types of programming languages. Some software uses visual block-based coding while others use text-based coding.

Scratch uses visual block-based coding to create algorithms.

Other computer programming software uses text-based coding, such as HTML.

Scratch Blocks

There are nine categories of blocks in Scratch. Blocks are shaped like puzzles as they fit and connect together vertically to create an algorithm.

Block Categories

Each block category has its own set of coloured blocks, which each have their own function.

- Motion
- Sensing
- Looks
- Operators
- Sound
- Variables
- Events
- My Blocks
- Control

Key blocks used in your **Haunted Castle Animated Story:**

	Moves the sprite forward.
	A speech bubble appears over the sprite for a specified time.
	Plays a chosen sound without pausing the algorithm.
	When a broadcast message is received, the algorithm activates.
	Used to repeat an algorithm for a specified amount of time. Each repeat of the algorithm contained within this block is one iteration.

Block Shapes

There are six different types of block shapes: **Hat**, **Stack**, **Boolean**, **Reporter**, **C** and **Cap**.

The main shapes that you will be using for your project are:

Hat blocks
Used at the start of every script.

Stack blocks
Used to perform the main commands.

C blocks
Used for looping blocks within the C block

Awesome Animation

There are many ways to develop your animations in Scratch. You could:

Add **Sounds**.

Add **Motion** blocks to sprites.

Change **Backdrops**.

Change **Costumes**.

Scratch

Key Vocabulary	
algorithm	A sequence of ordered instructions. In Scratch, **algorithms** are referred to as **scripts**.
backdrop	A changeable background that can be shown on the **Stage**. The backdrop can also be controlled by a script.
backpack	A space to store **scripts**, **costumes** and sounds so that they can be transferred from one project to another.
blocks	Puzzle-shaped pieces that connect to one another to make **scripts**.
costume	An alternative appearance for a **sprite**. **Costumes** can be viewed and chosen by clicking on the **Costumes** tab at the top of the **Block Palette**.
green flag	An icon that is commonly used to start a **script** running.
paint editor	A feature that can be used to create or edit **sprites** and **costumes**. The **Paint Editor** can be accessed in the **Sprite Pane**.
script	A series of connected **blocks** that perform a specific task.
sprite	A programmable character in Scratch.
variable	A changeable value that can be recorded in Scratch's memory. **Variables** are useful for creating a way to keep score in games.