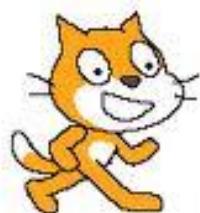


SCRATCH FOR PROBLEM SOLVING

(PDST/LERO)

SCRATCH



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Course Introduction

Scratch is a free application, developed by the MIT Media Lab, which allows users to create and share their own interactive stories, animations and games.

It is easier to use than traditional programming languages as it consists of graphical blocks which snap together.

This course enables teachers to learn how to use Scratch and introduce it to their pupils to help them explore aspects of the curriculum in an exciting and engaging manner. The course focuses on using Scratch to create projects which support the concepts, content and skills of the mathematics curriculum.

Participants completing this course will be enabled to:

Use Scratch programming to support teaching, learning and assessment in the primary curriculum.

Develop projects using Scratch.

Plan effective lesson strategies for using Scratch in the classroom.

Develop a Digital Learning plan to outline how it will be used in your classroom.

Module 1

ScRATcH



Module 1

Suggested Duration of Module

4 Hours

Objectives:

Content of Day/Module 1: Introduction to Scratch

Introduction to Scratch

Scratch Desktop

Getting Started with Scratch

Sound in Scratch

Discussion Time

Note: Tomorrow you will be using video with Scratch. If your venue does not have webcams or computers with webcams it is recommended that you bring your own laptop or tablet tomorrow. Most laptops and tablets have an in-built webcam.

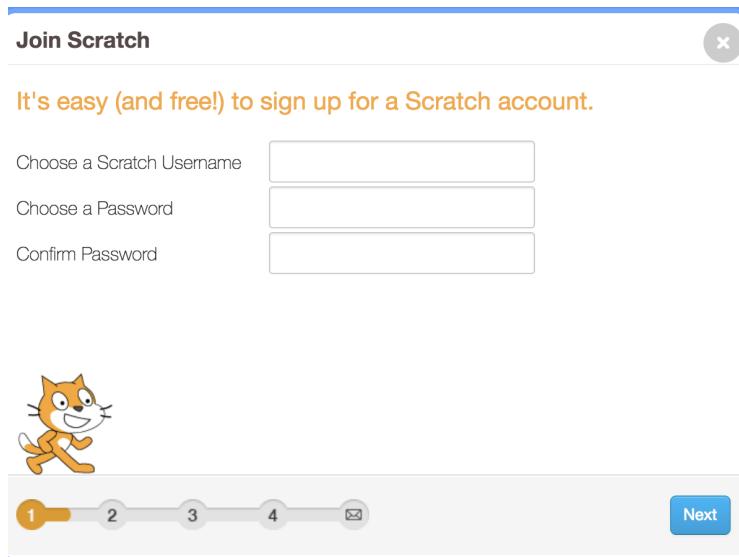
Introduction to Scratch

Scratch 3.0 is the latest version, replacing Scratch 2.0. Running Scratch 3.0 requires a relatively new web browser: Chrome 63 or higher, Edge 15 or higher, Firefox 57 or higher, Safari 11 or higher, Mobile Chrome 63 or higher, Mobile Safari 11 or higher. Internet Explorer is NOT supported. Navigate to Scratch 3.0 at scratch.mit.edu. Play the Introduction to Scratch 3.0 video linked to from the Scratch home page (or at <https://scratch.mit.edu?wvideo=joal01i8b1>)

The Scratch community puts a strong emphasis on collaboration and sharing work. The scratch.mit.edu website contains millions of projects created by users around the world. You can join this community by creating a Scratch account. Some teachers ask children to create individual accounts. However, others create a single class account.

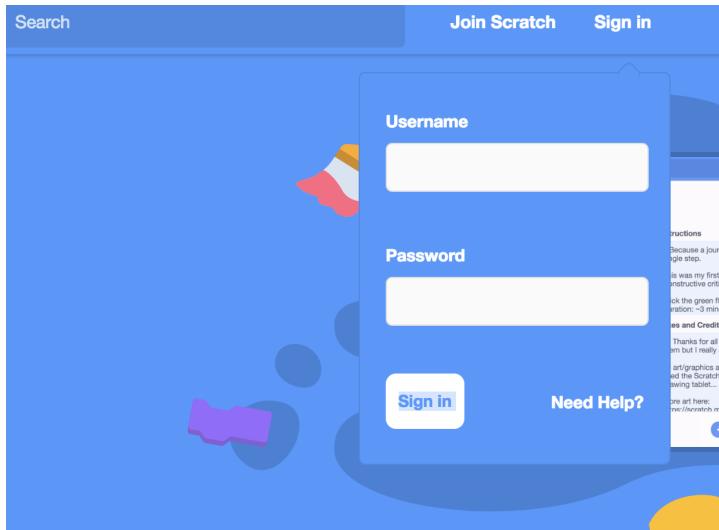
Click on “Join Scratch” to sign up for a Scratch account if you don’t have one already. An email address is required to sign-up.

Teachers can apply to have their account converted to a “Teacher Account” by clicking on “For Educators” under the “About” section on scratch.mit.edu. There is also a bank of resources available, including printable coding cards, available on this page.



A screenshot of the Scratch sign-up form. At the top, it says "Join Scratch" and has a close button. Below that, a message says "It's easy (and free!) to sign up for a Scratch account." There are three input fields: "Choose a Scratch Username", "Choose a Password", and "Confirm Password". At the bottom, there is a cartoon cat logo, a progress bar with four steps (the first is orange and labeled '1', the others are grey and labeled '2', '3', and '4'), and an envelope icon. A blue "Next" button is on the right.

If you have an account already click on “Sign In”.



Click “Create” to navigate to the Scratch programming environment. This is how to access the Scratch 3.0 online programming environment. Take some time to explore the scratch.mit.edu website (Click on Scratch, Create, Explore, Ideas and About menu options)

New Features in Scratch 3.0

Here are some of the new features in Scratch 3.0: This information is taken from the Scratch FAQ page. <https://scratch.mit.edu/info/faq#scratch3>

The new features are being highlighted for participants that are familiar with Scratch 2.0

Scratch 3.0 introduces some new blocks:

- New "sound effect" blocks
- New operators that make it easier to work with text (strings)
- New pen blocks, including support for transparency
- New glide block to move easily to a sprite (or random point)
- Many new capabilities through "Scratch Extensions"

Community Features

1. On the homepage, you can see what others have shared recently and scroll to see many more projects.



2. When viewing a project, click to see how it works and experiment with the code.
3. Inside any project, click to save your own version and make changes. After you share it, the project page will highlight the original creators and links to their projects.
4. Click your username or icon to go to your **Profile** page, where you can feature one of your projects and tell others what you're working on.
5. People can post comments on your Profile page and your Scratch account to see updates.

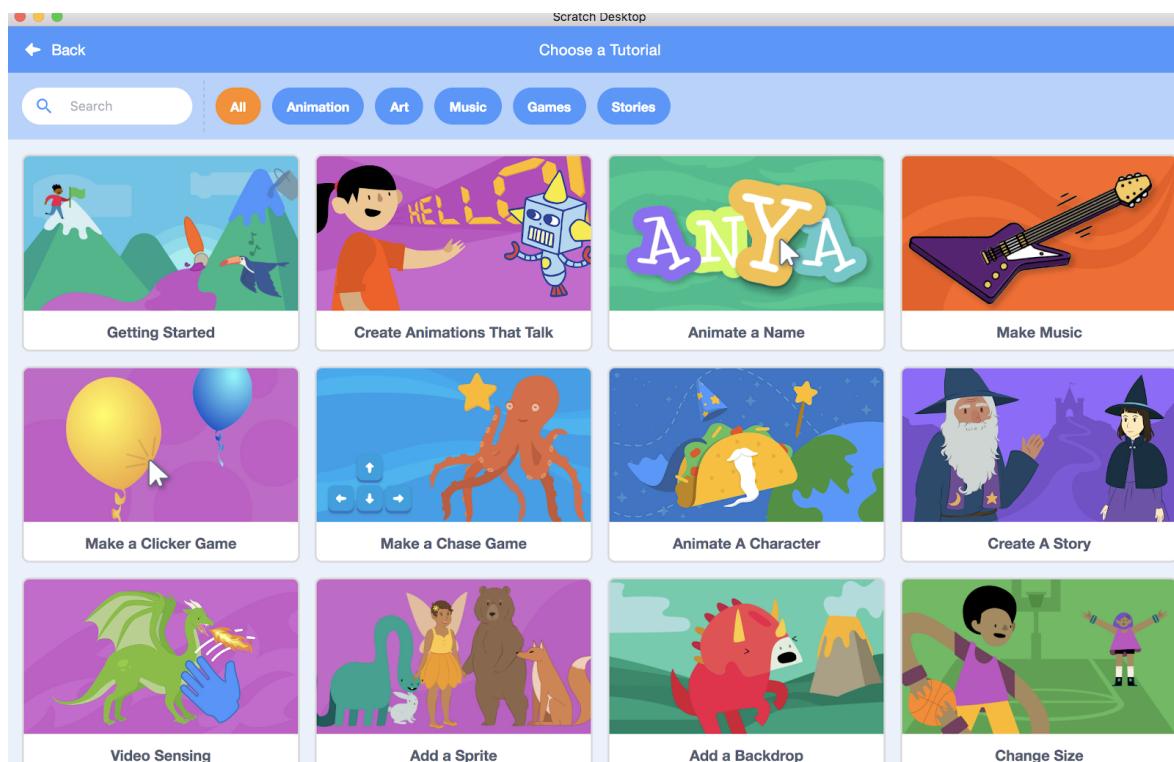
We will now prepare to use the Scratch Desktop.

Scratch Desktop

This course will use the Scratch 3.0 online editor. However, you may wish to use the offline editor, Desktop in schools. This will work on computers that are not connected to the internet. If you wish to install the offline version of Scratch 3.0, follow the instructions on <http://scratch.mit.edu/scratch2download/>. The Scratch Desktop editor is offline which means it is not dependent on a fast broadband connection.

Getting Started with Scratch

Once the offline editor is installed, start it and click on Tutorials. There are a series of video tutorials here to guide you through Scratch.



These tutorials introduce fundamental programming concepts and allow participants become familiar with the Scratch programming environment.

Participant Activity

Participants are now ready to complete some project work using resources on www.scratch.ie. This website is the home of Scratch in Ireland. It provides regular updates about training and the National Scratch Competition. It also contains a large bank of lesson plans for both primary and post-primary schools. To avail of the lesson plans it is necessary to register.

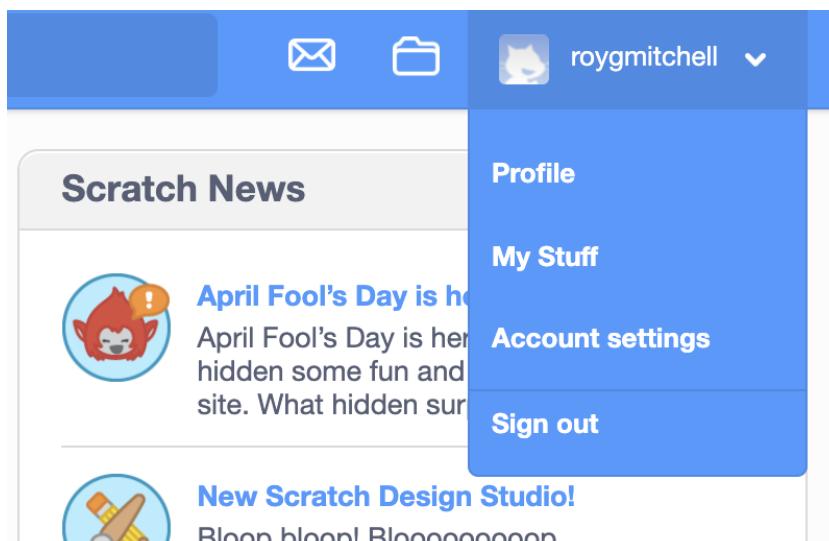
1. Go to www.scratch.ie.
2. Click on “Resources”, “Primary Resources”, “Lesson Plans”.

3. Click on “Register Here” and fill in your details. You will need an email address to register.
4. A password will be emailed to you that will enable you to access all lesson plans.
5. When you register, you will receive updates on Scratch in Ireland. If you wish, you may opt out of these email updates.

Click on <http://scratch.ie/primary/resources>. Choose Lesson 1 – Under the Sea. Complete Challenge Time 1. If you feel confident in this task, and if time allows, continue onto Challenge Time 2, and the Ultimate Challenge.

To save your project, click on “File” “Save to your computer” and give the project a meaningful name. This will save the project within the selected folder.

If you are ready to share your project online, go to scratch.mit.edu, sign in, and under your username, click on “My Stuff”. Click on “New project”, then on “File” and then “Load from your computer”.



Shared projects

By default, when you create a project on scratch.mit.edu or if you upload a project from the offline editor it will not be shared publicly. To share the project you need to open it online and click on the ‘share’ button.

Comments

Once a project is shared, another user can add comments to your project. You

can turn off the functionality by click “Turn Off Commenting” if you do not want users to comment on your project.



Studios

You can add projects to studios by clicking “+ New Studio”, decide if you want to “allow anyone to add projects” and then click on “Add Projects” to add projects to your studio. Your tutor will create a studio where the group can share work they have created this week. Sharing and explaining projects is a vital element of Scratch in the classroom. Use the studio URL to identify the studio.

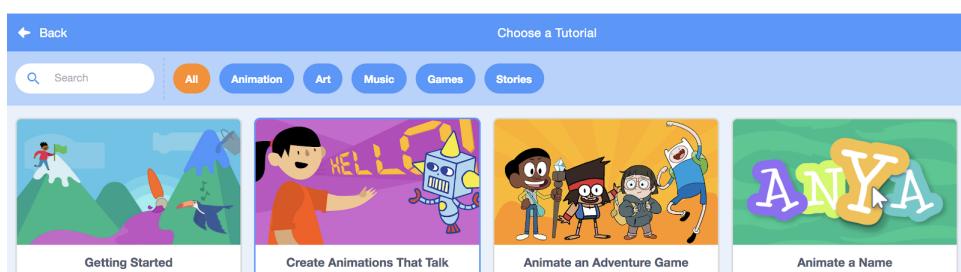
Languages

Scratch is available in many different languages. The language can be changed by clicking on the globe icon at the top bar of the editor.



Costume Changes

Costume enables users to create very effective animations quite easily. Click on Tutorials and view the videos on animation.



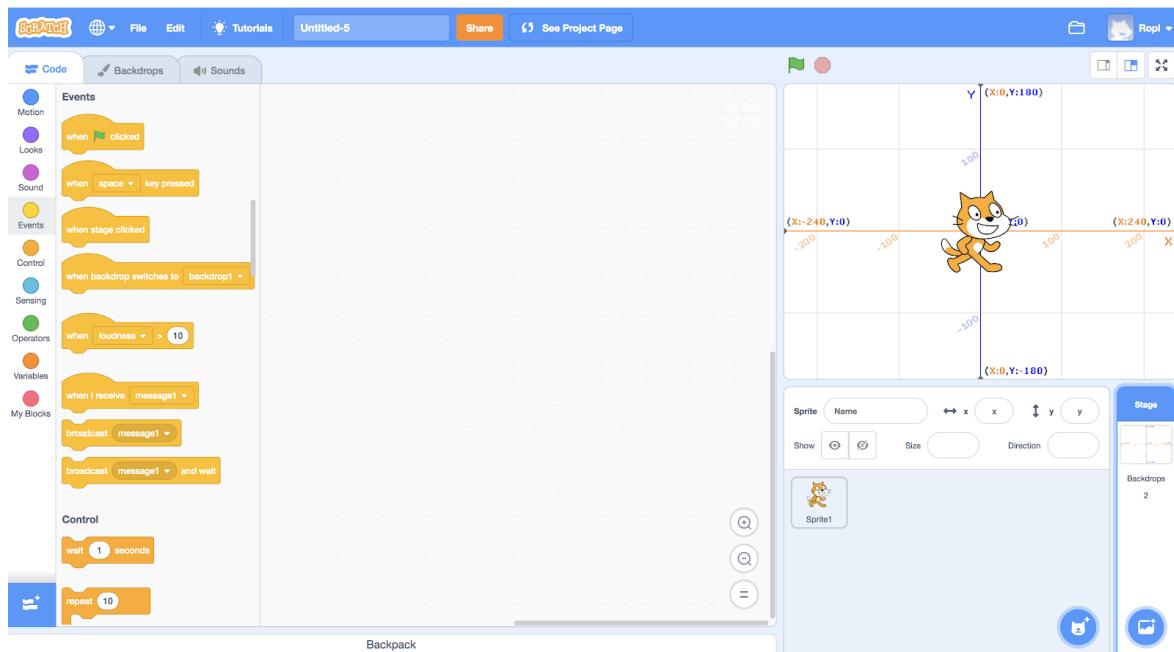
Coordinates and directed numbers in Scratch

The following is taken from the Mathematics curriculum:

The child should be enabled to:

- Identify positive and negative numbers
- Add simple positive and negative numbers on the number line

One of the default backgrounds in Scratch is an XY Grid. Import this background into Scratch and it will show the XY position of your sprite.



Note the X and Y coordinates of the cursor position are shown at the bottom of the window.

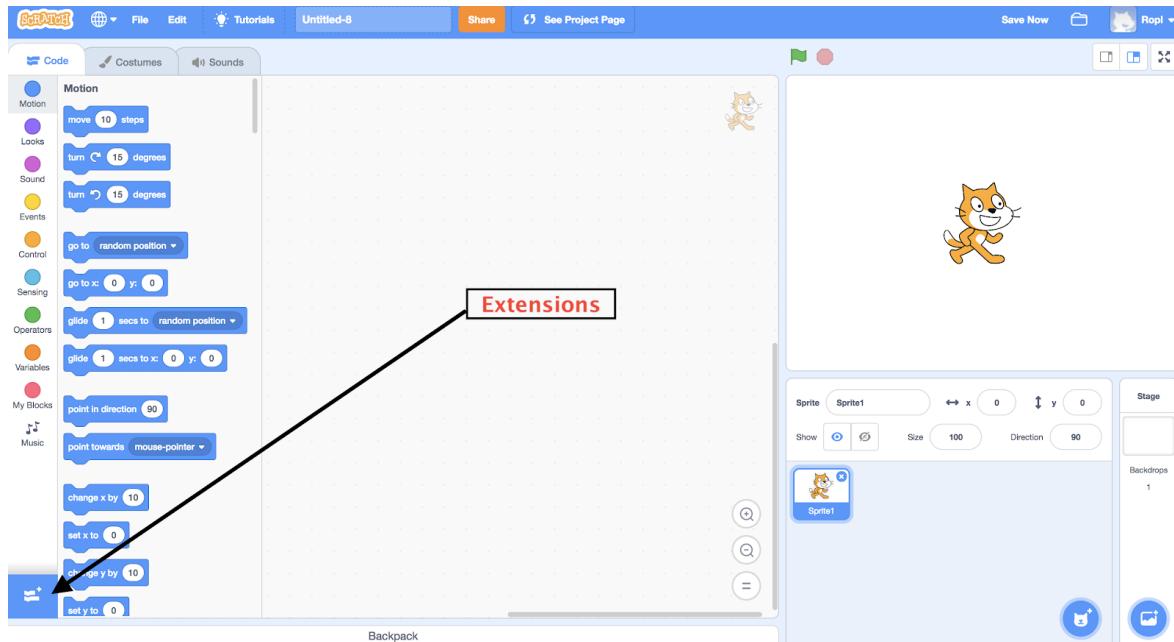
Participant Activity

Write a Scratch programme that moves a sprite into each of the four quadrants of the XY Grid. Extend the activity by getting the sprite to say his position.

Extension Activity: We will be looking at changing the background later in the course but could you create a project that links to the geography curriculum? Perhaps you could take a sprite on a tour of Ireland, Europe or the world?

Sound in Scratch

To use sound/music in Scratch you will need a set of speakers or headphones. Click on the “Extensions” button as shown below and then click on “Music” Extension to access music extensions.



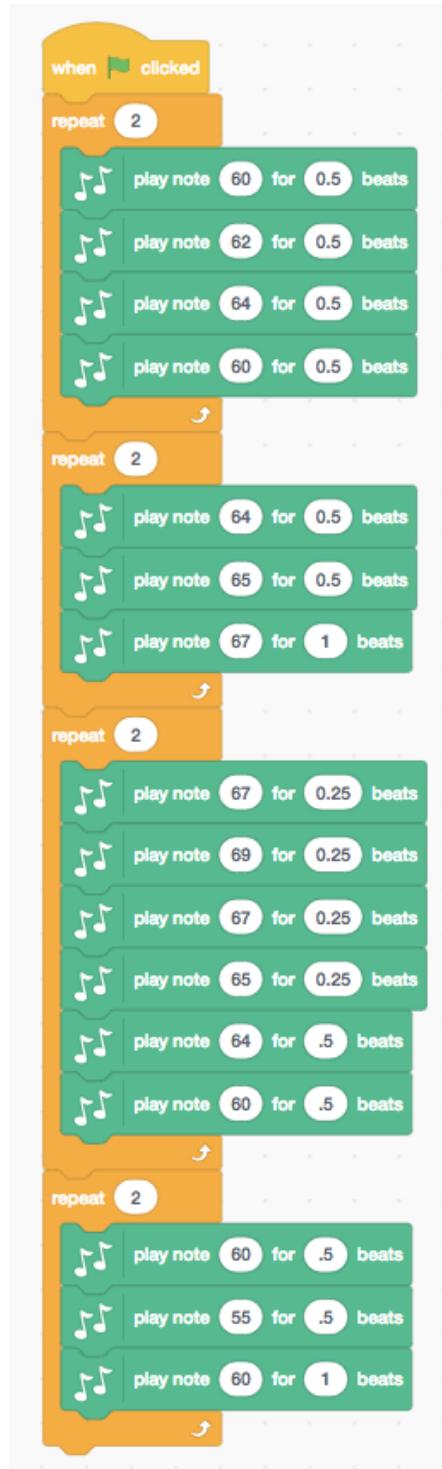
Drum Beat

- Drag out the “play drum (1) Snare Drum for 0.25 beats” block.
- Use the drop down arrow to select different percussion instruments.
- Duplicate this block by clicking right and change the length of the beats to create a rhythm.



Musical Notes

Input the following code. Do you recognise the music?

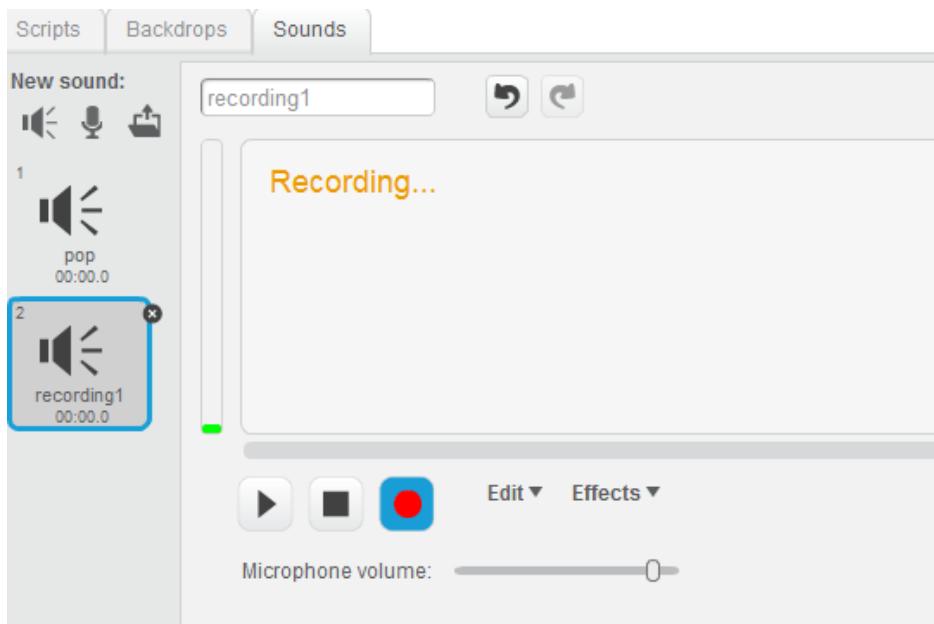


Participant Activity

Can you create a song using Scratch? Perhaps you could create a tin whistle tune from school. You can search the internet for notes for different songs. When you are finished upload your song to the studio and share it with the group.

Sound Files

- Click on the sounds tab. Click the loudspeaker to “Choose sound from library” and select some sounds from the folder. Once selected these will appear as a list in the sound tab.
- You may also import sounds that have been saved to desktop from websites such as www.pacdv.com/sounds.
- Click back into the scripts tab.
- Use the “Play Sound” block to incorporate the sounds you have chosen.
- In the sounds tab you can also record your own sounds. Most laptops have an inbuilt microphone. If this is not present you must attach an external microphone to record.



- Sounds may also be added to the background.

Participant Activity

1. Go to <http://scratch.ie/primary/resources>. Choose Lesson 3 – Battle of the Bands. You will need to enter your password to access this lesson.
2. Complete Challenge Time 2. If you feel confident in this task, and if time allows, continue to the Ultimate Challenge.

Discussion Time

Today's objectives were to cover:

Introduction to Scratch

Installation of Scratch Desktop Editor

Getting Started with Scratch

Discussion Time

Discuss the day with your colleagues and reflect on what you have learned.

Discuss the cross curricular use of Scratch in particular for music and SESE.

Discuss aspects of Scratch that are relevant to numeracy. What could you use in your classroom if you were teaching tomorrow?

Module 2

ScRATcH



Module 2

Suggested Duration of Module

4 Hours

Objectives:

Content of Module 2:

Exploring numeracy in Scratch

Communicating in Scratch

Gaming in Scratch

Images and video

Discussion Time

In Module 2, we will consider Scratch in the context of the primary mathematics curriculum. We will further enhance Scratch capabilities of participants, with particular emphasis on concepts related to numeracy.

Exploring Numeracy in Scratch

The mathematics curriculum for primary comprises five strands:

Number
Algebra
Shape and Space
Measures
Data

Note that Scratch can be used in lots of different subjects while still incorporating these numeracy skills.

Skill	Examples of its use in Scratch
Applying and problem-solving	<ul style="list-style-type: none">• Breaking down a problem into individual tasks• Creating solutions to solve problems
Communicating and expressing	<ul style="list-style-type: none">• Pair work or Group work• Class discussion at end of Scratch lesson - ask children what went well, what didn't work, ask children to solve Scratch errors for each other
Integrating and connecting	<ul style="list-style-type: none">• Connect informally acquired mathematical ideas with formal mathematical concepts• Carry out mathematical activities which involve other areas of the curriculum
Reasoning	<ul style="list-style-type: none">• Sequential and logical thinking• Reading through pieces of code
Implementing	<ul style="list-style-type: none">• Use appropriate Scratch tools to complete tasks
Understanding and recalling	<ul style="list-style-type: none">• Recalling the function of each block• Understanding which blocks will be most helpful in a specific project or a specific piece of code

For more details on this see:

http://www.curriculumonline.ie/getmedia/9df5f3c5-257b-471e-8d0f-f2cf059af941/PSEC02_Mathematics_Curriculum.pdf

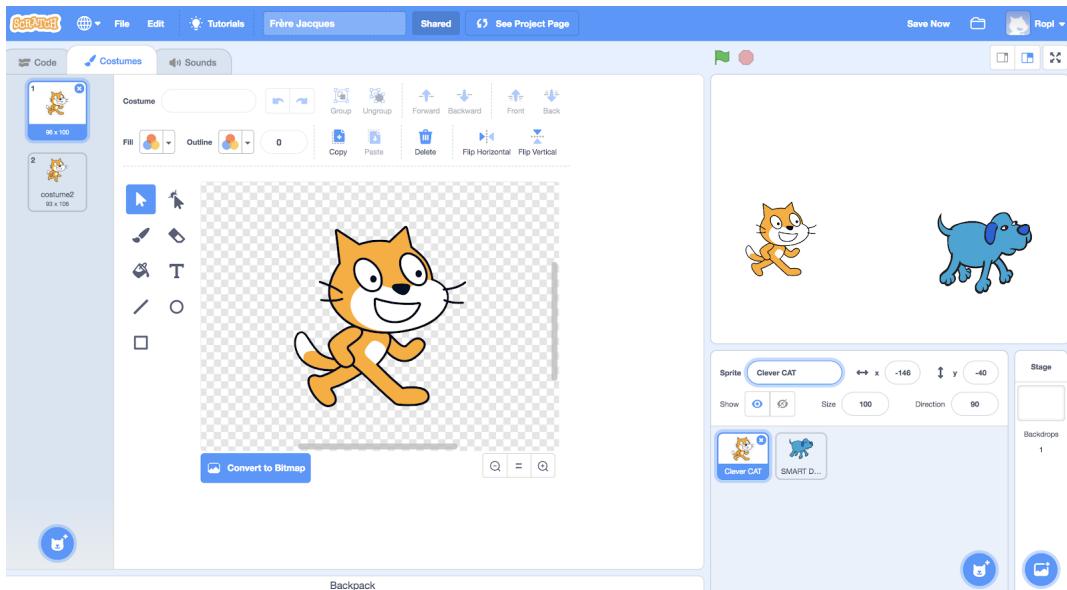
Communicating in Scratch

In Scratch we use broadcasts to communicate between sprites and between different parts of the programme. Broadcasting is a very useful tool to control the flow of a programme. We will cover this important concept now.

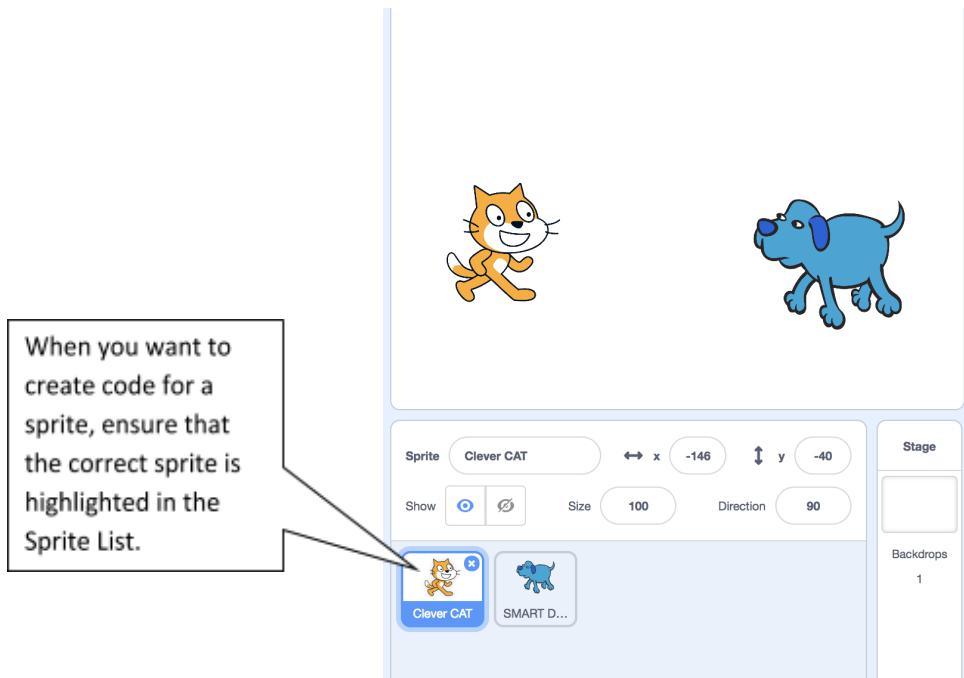
A broadcast is used to send a message from one sprite to another or from one part of the programme to another. A broadcast is like a radio signal. It is sent out from one sprite or background. It is received by all the sprites and the stage or background. Once a sprite receives a broadcast it can be programmed to react in a particular way.

Participant Activity

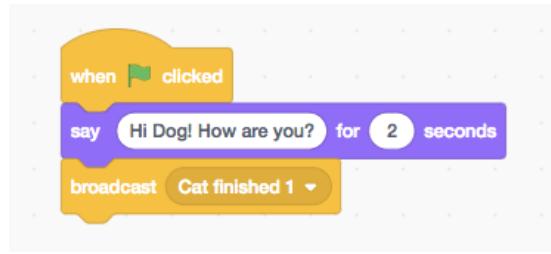
1. Select two sprites from the folders or draw two sprites.
2. We are going to code a conversation between these sprites so have them face each other.
 - a. If a Sprite is turned the wrong way, click on the costumes tab. This brings you into the Paint Editor. Click “Flip horizontal”.



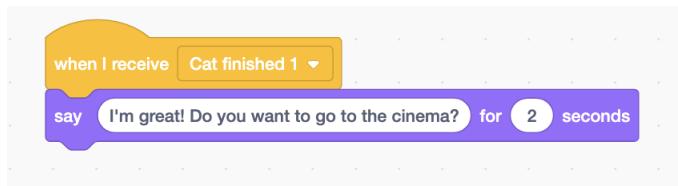
3. Give your Sprites meaningful names e.g. Clever Cat
4. We will code the first Sprite's first words. Ensure the Sprite is highlighted in blue in the Sprite List. Click on the Code tab.



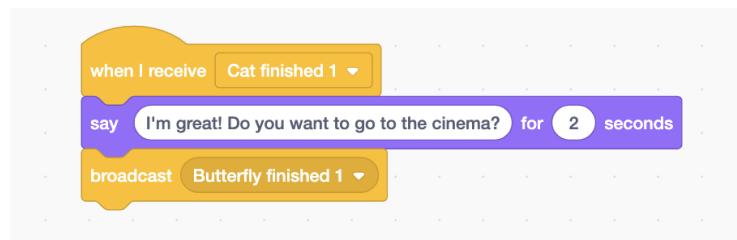
5. Use the purple Looks Palette. Pull out "Say Hello for 2 secs". Click on Hello to edit the speech. Add an event block.



6. To get the second sprite to speak we must first send out a signal that the first sprite is finished speaking. This is what a broadcast is for.
7. Click on the Events Palette. Pull out the “broadcast” block. Click on the black dropdown arrow. Select message1 or create a different name of your choice to name the message.
8. Broadcasts work in the code but do not appear on the stage.
9. If you run your code now this broadcast is sent out by the sprite and received by every sprite and the stage. We must now programme our second sprite to react once it receives the broadcast.
10. Click the second sprite in the Sprites Area.
11. Pull out the “When I receive Cat Finished 1” block from the Events Palette or use the dropdown arrow to select the name of your broadcast message. You can then reply and ask something else.



12. You can then add a second broadcast to this piece of code. This will send a broadcast out and the first sprite will receive it



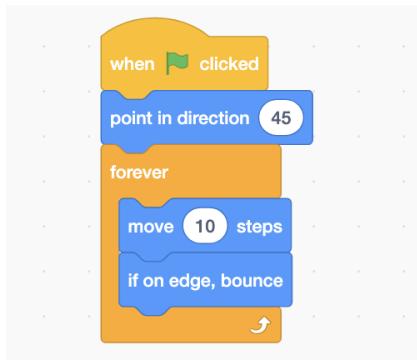
13. Continue in this way until the conversation is complete.

Broadcasts can be used to initiate any action within Scratch. The following activity uses broadcasts while also incorporating the Sensing Palette.

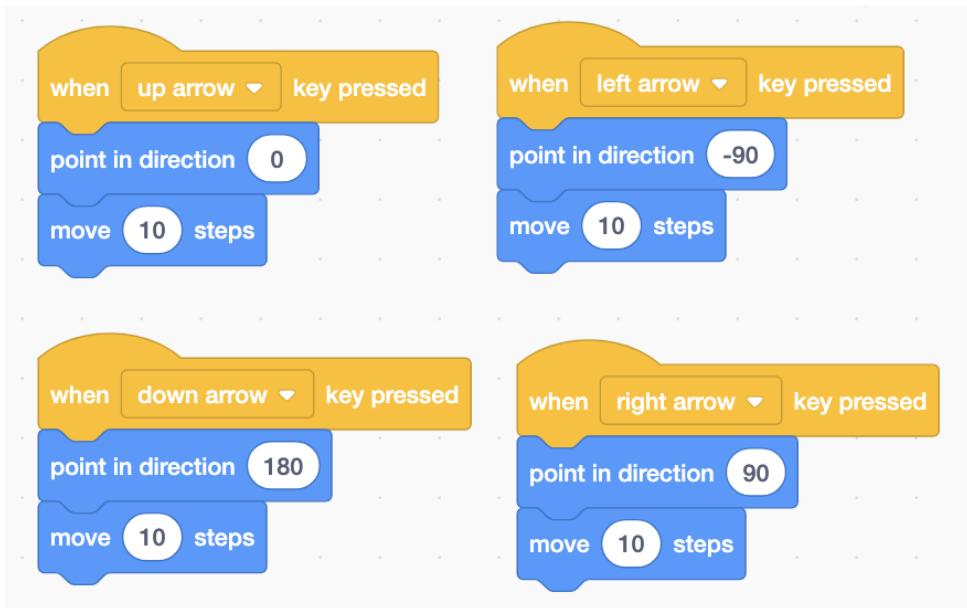
Gaming in Scratch

This is a simple chase game. One sprite will move randomly around the screen. A second sprite, controlled by the user, will move around the screen trying to avoid the first sprite.

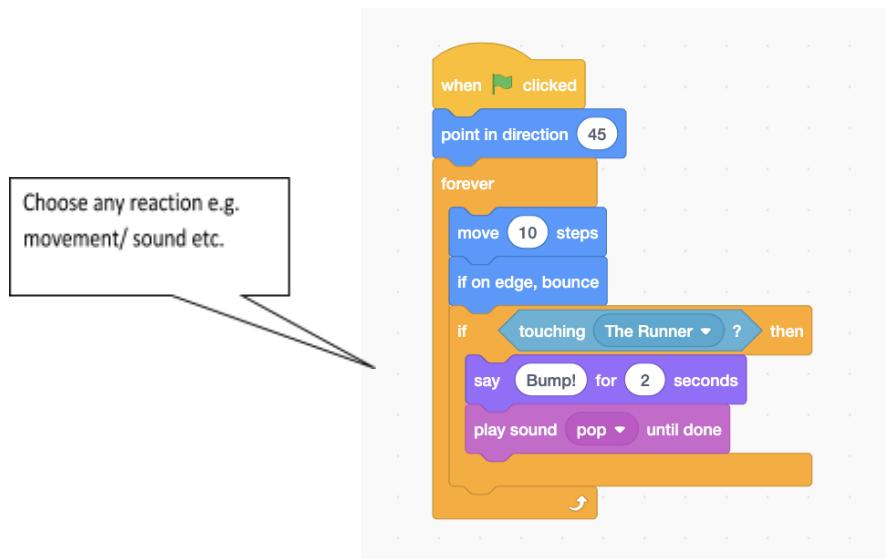
1. Choose a sprite. We will call it The Chaser. Create a script that allows it to move randomly around the screen.



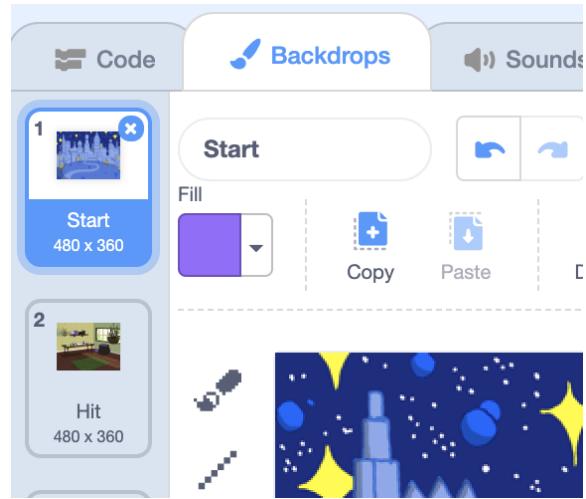
2. Choose a second sprite. We will call it The Runner. Create scripts that allow it to move up, down, left and right.



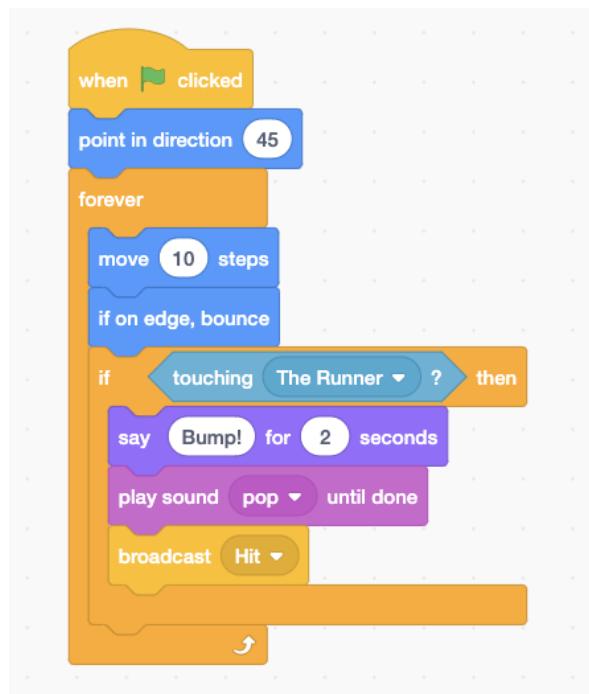
3. We want a reaction when The Chaser catches The Runner. This requires the “if” loop and the Sensing palette.



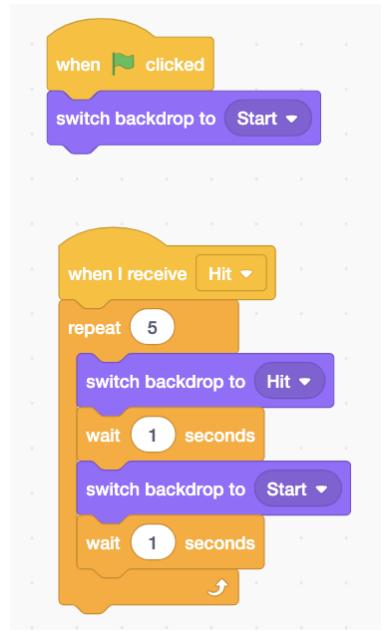
4. Create or import two backdrops for your game. One will show while the game is running. One will show when the sprites are touching and the game ends.



5. The Chaser will send out a broadcast when it touches The Runner.



6. When the stage receives this broadcast it will switch backgrounds.



7. Save this game with a meaningful name.

Variables

A variable is a value that is not constant, it changes. While variables are only mentioned explicitly in the sixth class Maths Curriculum, they can be seen at younger levels too:

$$\text{Area} = \text{Length} * \text{width} \quad (a = l * w)$$

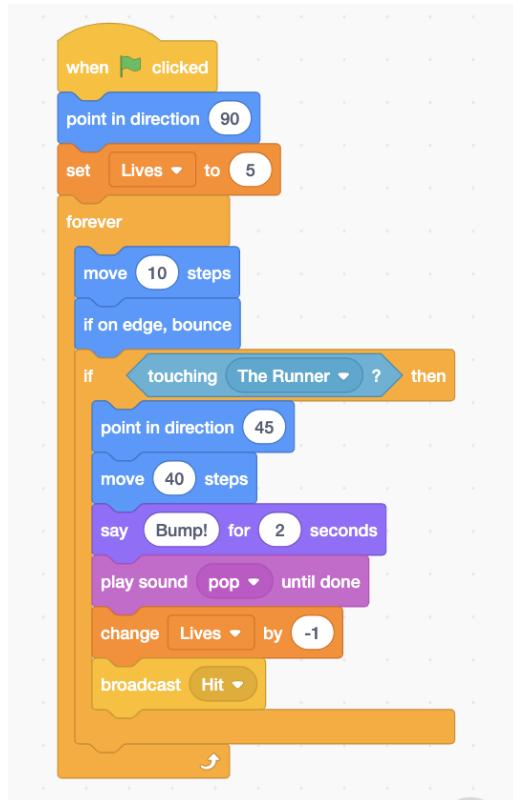
$$\text{Diameter} = 2 * \text{radius} \quad (d = 2 * r)$$

$$\text{Speed} = \text{Distance}/\text{Time} \quad (S= D/T)$$

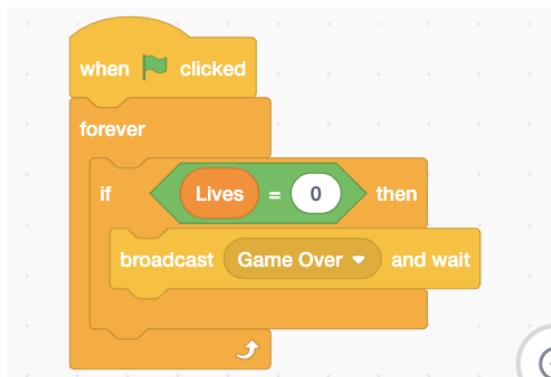
In Scratch, the children can use simple variables to enhance their games.

Participant Activity

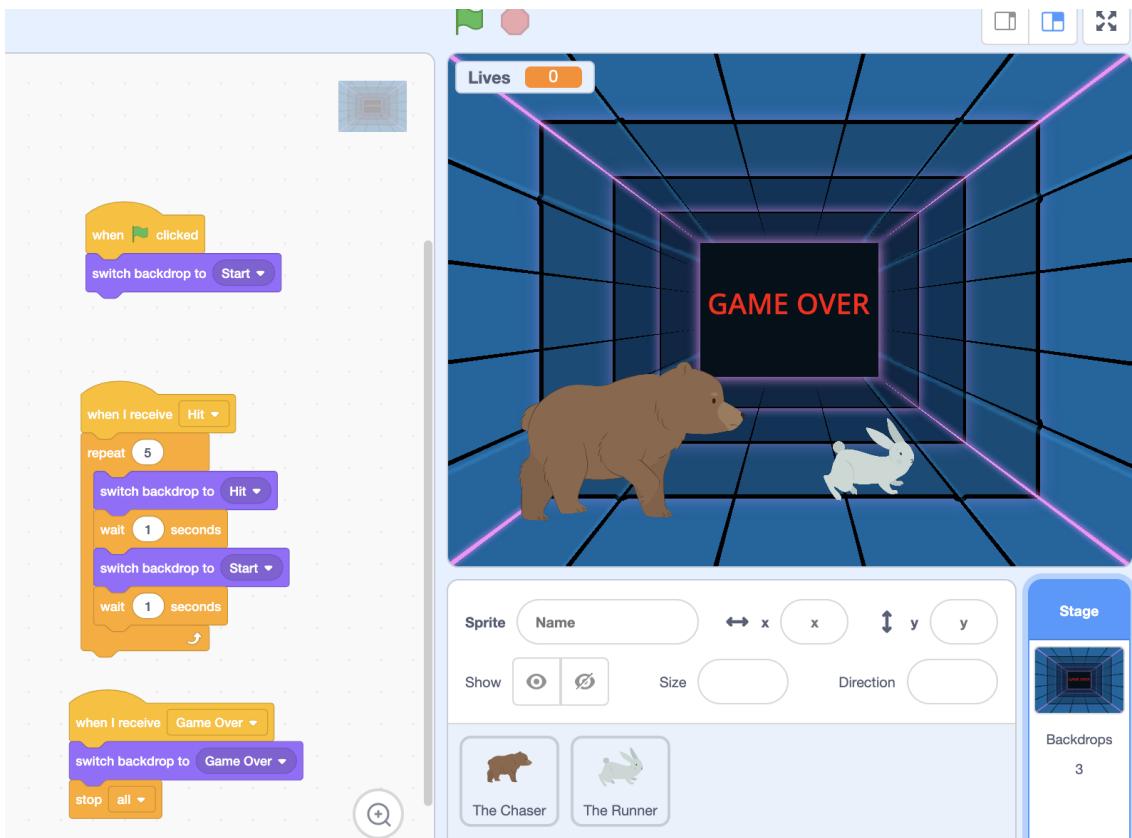
1. Reopen the chase game you created earlier.
2. Click on the Variables Palette and select “Make a variable”.
3. Create a variable called “Lives”.
4. We want to start with five lives. Each time the sprites touch we will lose a life.



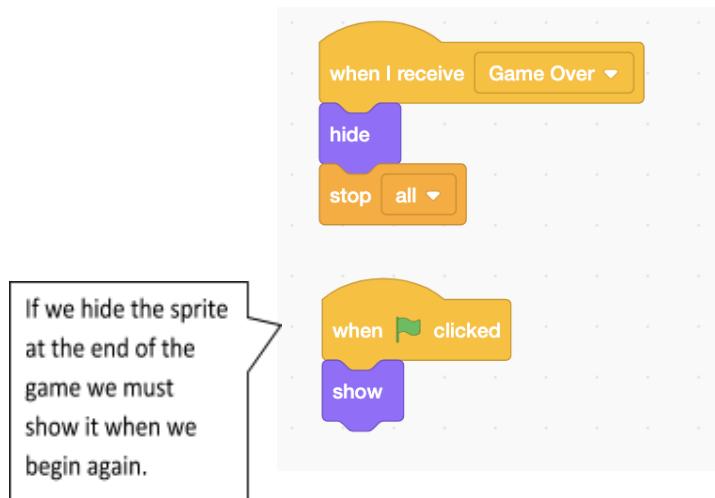
5. What happens when the lives reach 0? We need to create a programme to tell the sprites what to do. This will require a broadcast.
6. The piece of code will constantly check the lives. If the lives are 0, it will send out a broadcast. We can call this broadcast Game Over.



7. Create another background that will appear when the game ends.

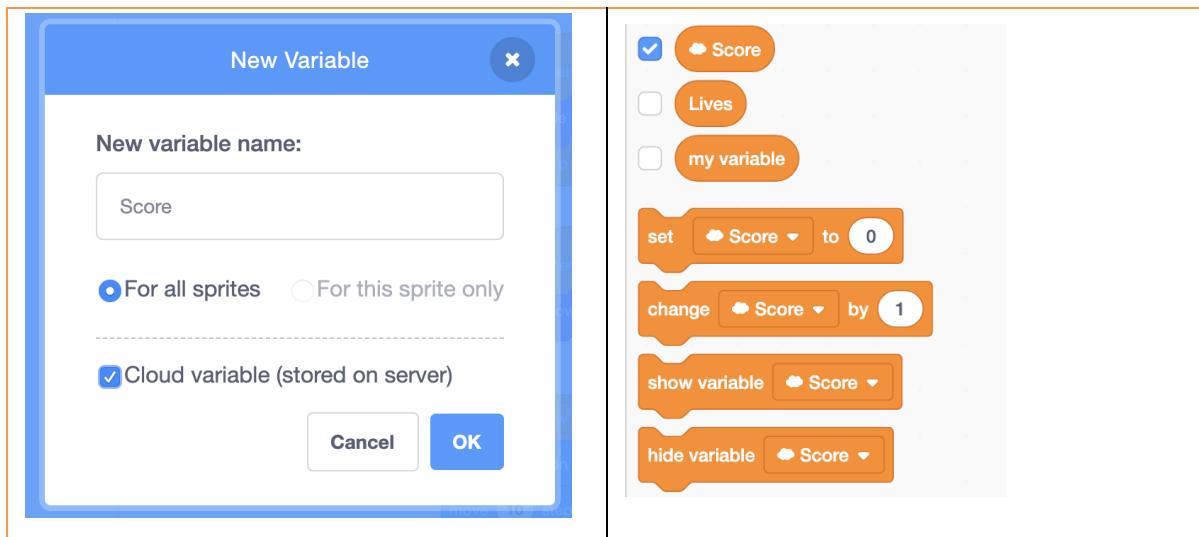


8. We can hide the sprites at the end of the game.



Scores in the Cloud

When working online in Scratch, you have the option to create a variable in the cloud (denoted by the cloud!). For example, a score cloud variable in your game is shared and seen by everyone running your Scratch project. You could use this to keep a high score for your Scratch game.



Images and video

Scratch projects may use images and video to increase the engagement factor and to allow students to personalise their projects.

The use of images in Scratch

In order to make Scratch projects personally meaningful to children, it may help to use a greater range of images. These may be downloaded from the internet, uploaded from external devices such as digital cameras, or taken from files already saved on the computer.

search.creativecommons.org

The Creative Commons search functionality allows users to search Google Images, Flickr, Fotomedia, Wikimedia and Pixabay for images that have a Creative Commons License and can be downloaded and edited without any copyright infringement.

Finding suitable images for Sprites

Children often want to use images of their favourite characters from the

internet in their Scratch projects. If the image has a lot of colour and detail in the background it can be difficult to edit and use in Scratch. It is suggested that transparent or png files be used. If a child is searching for a cat image to use they could enter the search term “cat transparent”.

Participant Activity – Downloading images from the Internet

1. Create a folder on your desktop.
2. Label it “Scratch Resources”. This is where you will save all images and sounds that you intend to use in Scratch.
3. Find an image you wish to use on search.creativecommons.org or through an alternative search engine. Remember to look for transparent images if possible.
4. Save the image to your new folder, giving it a meaningful name.

Participant Activity - Save an image from a digital camera or mobile phone

1. Find an image you wish to use on the digital camera.
2. Open the “Scratch Resources” folder.
3. Drag the image into the “Scratch Resources” folder.
4. Once the image is saved to the folder you can open it in Scratch.

Participant Activity – Using Images in Scratch

1. Open Scratch interface.
2. Delete the cat sprite.
3. Click on “Upload sprite from file”.
4. Navigate to the desktop.
5. Choose the folder you created earlier, “Scratch Resources”.
6. Select the photo you wish to use.
7. When you import a photograph it may contain other images that you do not want, e.g., a white background that has to be deleted.
8. Click on the photograph in the sprites area.
9. Click on the costumes tab
10. Click on edit. This will open the paint editor where you can delete

backgrounds, alter colours and size and add text.

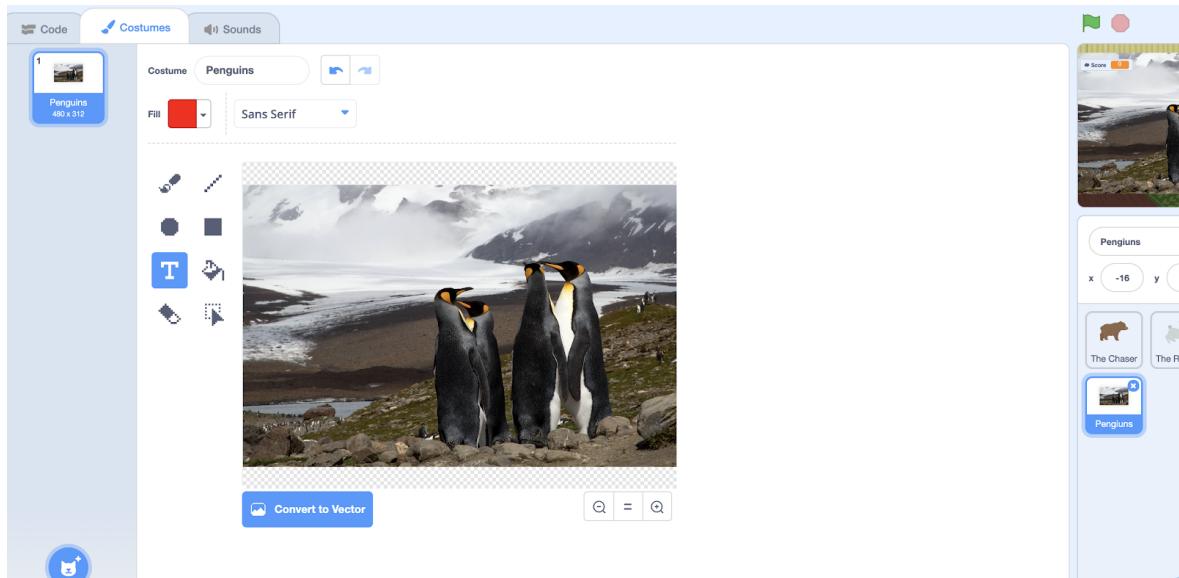


Photo by Brian McMahon on Unsplash

11. For full details on the Scratch Paint Editor see:

http://wiki.scratch.mit.edu/wiki/Paint_Editor

Participant Activity – Create a Scratch Project that Incorporates Images

1. Working in pairs, take images using your smartphone or alternatively find suitable images from the internet
2. Incorporate sounds and images into a numeracy focused Scratch project.

Participant Activity - Images in Scratch

1. Go to www.scratch.ie or to where you have saved the downloaded lessons.
2. Open Lesson Plan 4 – A Cartoon About Me!
3. Complete the Ultimate Challenge.

Video in Scratch

The new Video feature in Scratch 3.0 is definitely worth checking out and introducing to your students. Browse the Video Sensing projects on

http://scratch.mit.edu/starter_projects/ to experience the video capabilities.

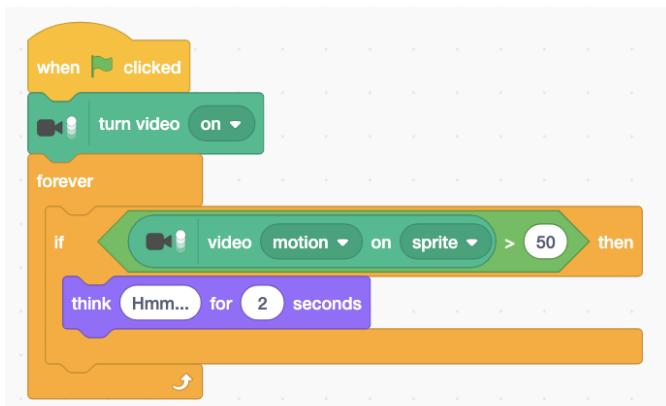
You will need a webcam on your machine to explore video.

To get started with video, get a sprite on the Stage and turn on the video. Click on the “Extensions” and then click on “Video Sensing”.

Once you turn on video, you will be asked to Allow Camera and Microphone Access. Click “Allow”.



Check the video motion on the sprite and perform an action if motion is detected on the sprite. (In this case we say Hello)



You can check the value of the video motion by checking the “video motion on this sprite” box so it displays on the screen.

Participant Activity – Explore Video Functionality

Working in groups to build a Scratch project using video blocks. Share your project in the group studio and explain how you created it.

Discussion Time

Today's objectives were to cover:

Exploring numeracy in Scratch

Communication in Scratch

Gaming in Scratch

Images and video

Discussion Time

Discuss the day with your colleagues and reflect on what you have learned.

Discuss aspects of Scratch that are relevant to numeracy. What could you use in your classroom if you were teaching tomorrow?

Module 3

ScRATCH



Module 3

Suggested Duration of Module

4 Hours

Objectives

Module 3 will cover:

Exploring numeracy in Scratch

Problem Solving

Drawing in Scratch

Discussion Time

Exploring Numeracy in Scratch

In this section, we will cover more features in Scratch that can be used to create Scratch numeracy related projects. These include variables and operators, timers and maths functions.

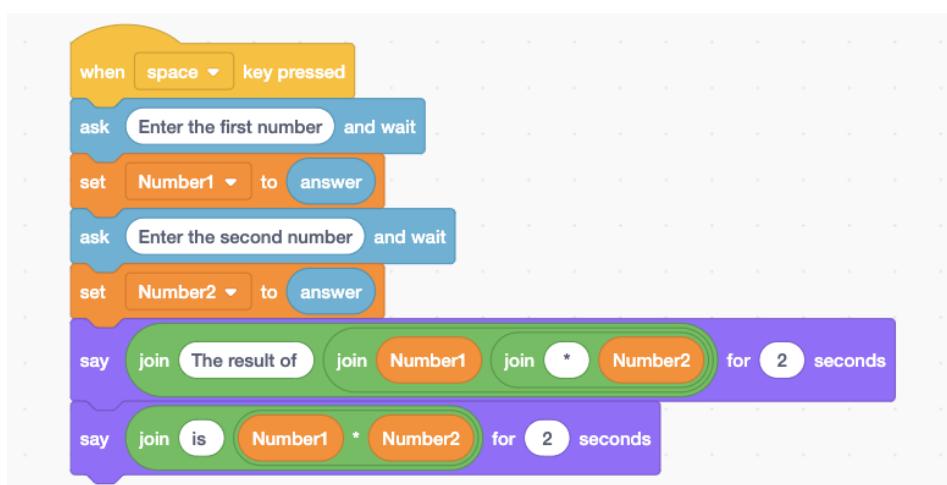
Variables and the Operators

Variables can be used in conjunction with the Operator's Palette for specific maths tasks.

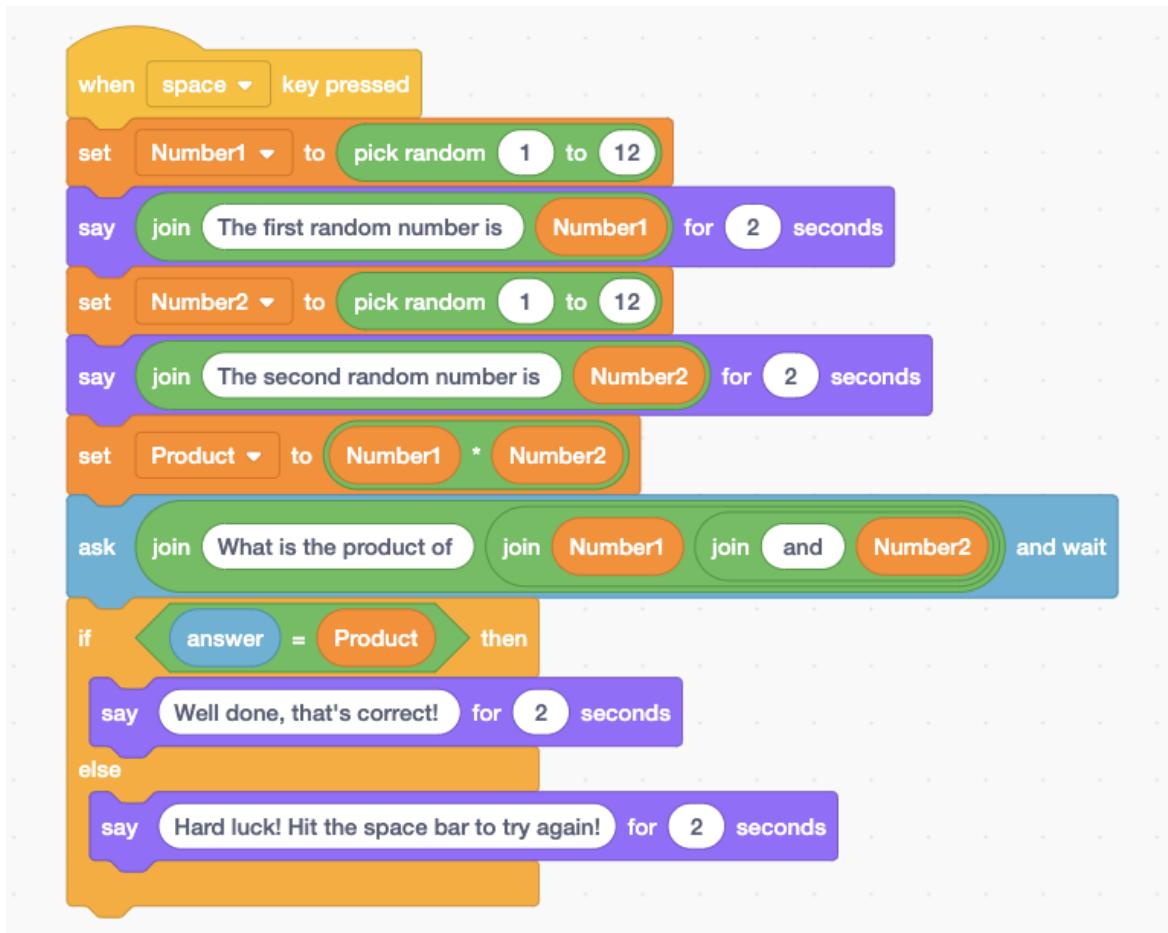
The Operator's palette in Scratch is very useful and we can immediately see applications for Mathematics tasks. The various blocks will instruct the programme to carry out addition, subtraction, multiplication, division and rounding.

Participant Activity – Find the Product of two numbers

1. Create two variables where we will store numbers inputted by the user. Here we have named them “Number 1” and “Number 2”.
2. Use the Sensing Palette to ask the user to type a number. The blue question and blue answer enables people to add user interaction to their projects.
3. These numbers will be saved as variables.
4. The green Operator's Palette will allow us to multiply the two numbers together.



Alternatively you could make this into a quiz by changing it slightly.



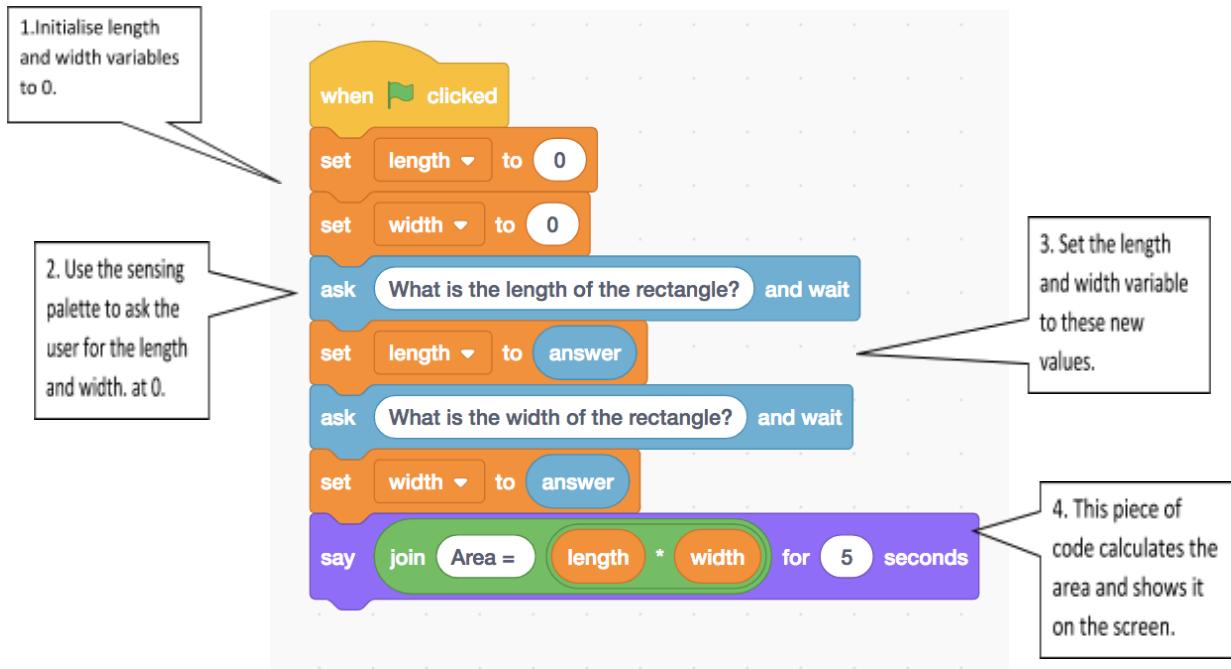
5. Alter the above code to make addition, subtraction and division tasks.
6. Modify the code to allow the user to choose what type of operation is performed.
7. Take note of the nested join statements and experiment with them.
8. Save your work.

Participant Activity – Find the Area of a Shape

This lesson uses Scratch to calculate the area of a square or rectangle.

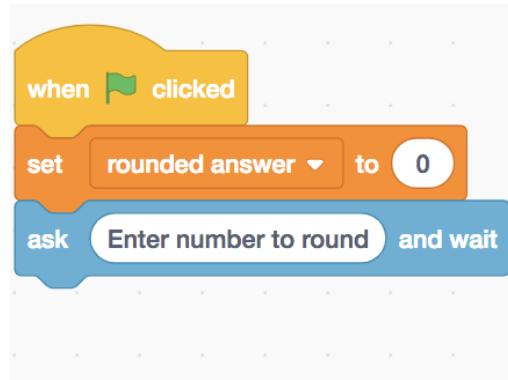
1. Create 2 variables, one called Length, the other Width.
2. Allow the user to enter the values for length and width. You will use the blue “ask” and “answer” block from the sensing palette.
3. Use the Operator’s palette to find the area.

- Output the answer onto the screen.

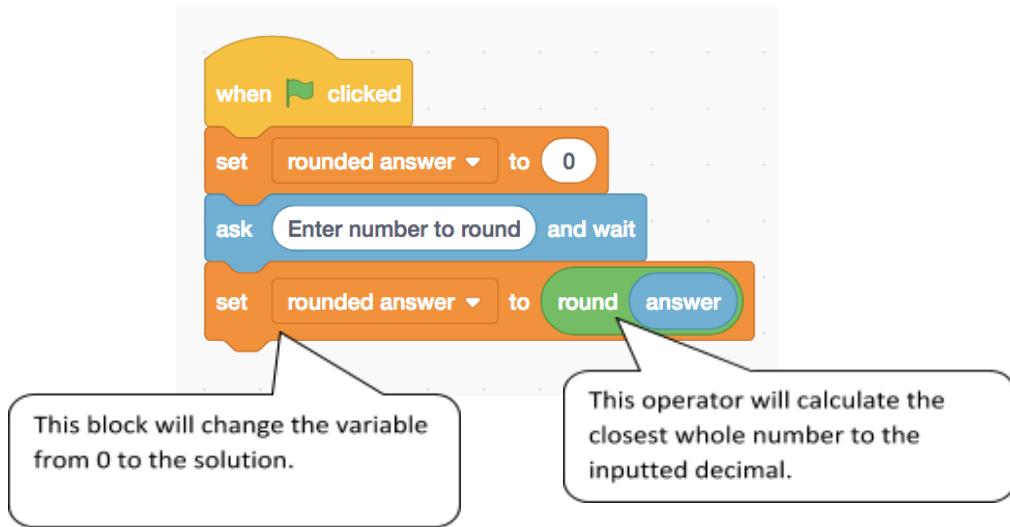


Participant Activity – Rounding Numbers

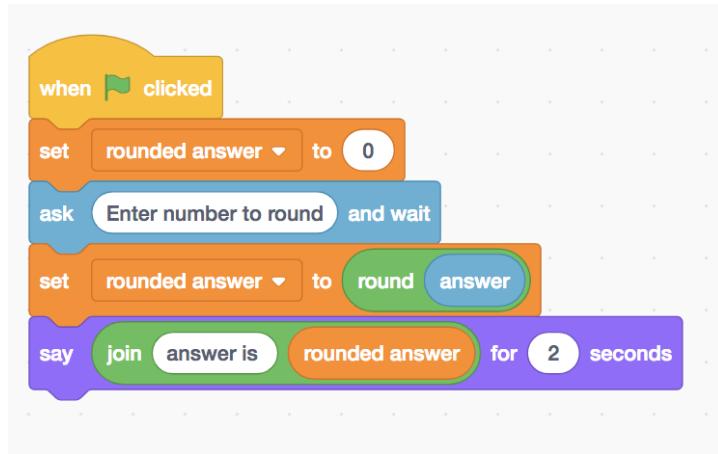
- Click on stage and then click on backdrops.
- Choose a backdrop from the library.
- Select a sprite. You may delete the cat if you use another sprite. This sprite will ask the user to input a decimal and will give the rounded answer.
- The script will use a variable and operators. We will call the variable “RoundedAnswer” as this is what we are looking for. The first block, “set RoundedAnswer to 0” will ensure that, each time we run the script, the initial value will be 0.
- The sprite must ask the user to input a decimal.



6. The blue block asks a question of the user and the response is saved in the blue “answer” block. This answer can then be used in various calculations. In this case we will round it to the nearest whole number and output the solution as the variable “RoundedAnswer”.

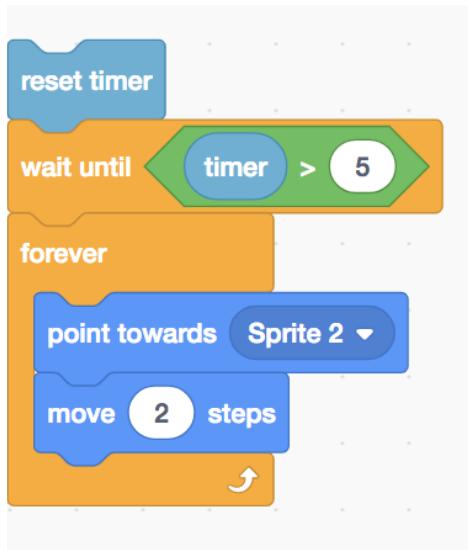


7. We must now display the solution on the stage.



Timers in Scratch

A timer can be a useful tool in Scratch allowing the user to complete a particular action within a specified time period for example in games or quizzes.



Participant Activity

Enter the code above and make some alterations to demonstrate the use of the timer. Alternatively, could you add a timer into the quiz you created to see how many questions someone can answer in a minute.

Random numbers

Random numbers can be used in Scratch projects to reposition sprites in

random locations, to assign random numbers of lives,

Cloning

You may need multiple instances of the same sprite in a Scratch game. It is possible to duplicate a sprite in Scratch using the cloning feature. Here are two examples of projects using the clone block:

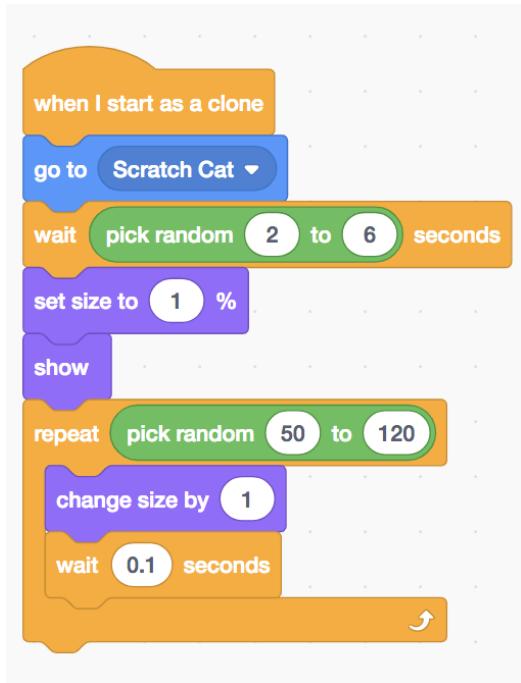
<https://scratch.mit.edu/projects/10003371/> and

<https://scratch.mit.edu/projects/24379483/>. Click on the ‘See Inside’ button to see how clones are created.

If we look at the code in the first example above we can see that the cat sprite moves across the screen and every 50 steps he tells the palm tree to create a clone of itself.



If we then look at the palm tree sprite we can see that when it is created as a clone it waits a random length of time and selects a random size for the tree.



Participant Activity – Create a project using the clone functionality

Can you create a small Scratch project that demonstrates the use of the clone functionality. Perhaps you could make a clone appear when a certain key is pressed.

Problem Solving

Children will be problem solving from the moment they start using Scratch. They will plan, execute and debug their programmes. You may also wish to use Scratch to support more formal mathematical problem solving.

Word problems feature frequently in Maths textbooks. They can be the most challenging aspect of any topic. However, by allowing children to use Scratch we can bring the problem to life. View the following examples.

Q1. There are 12 apples in one box. How many apples are there in 6 boxes?

A1. <http://scratch.mit.edu/projects/ballns/2524268>

Q2. The monkey has 16 bananas. He eats 7. How many bananas are left?

A2. <http://scratch.mit.edu/projects/ballns/2553431>

There are some great examples of Scratch projects created by the students

using their problem solving skills and numeracy. See the following projects that progressed to the Scratch competition national finals.

“So you think you can count” <http://scratch.mit.edu/projects/19247368/>

“Lámh Lámh Eile” <http://scratch.mit.edu/projects/19325973/>

Participant Activity – Use Scratch to demonstrate the solution of a word problem

In Microsoft Word or on a piece of paper, create a word problem which is suitable for your class level. Ask the person/group beside you to solve this word problem in Scratch. They may create an animation that shows the solution or a game that demonstrates understanding of the Maths concept. Could you use some of the features learned today such as cloning and operators?

All projects that progressed to the finals of the national scratch competition are available here: <http://scratch.ie/competition>

Drawing in Scratch

Drawing in Scratch relies on very specific instructions. Scratch drawing works in a similar way to the programming software, Logo.

It is as if your sprite is holding a pencil. Whenever the sprite moves it leaves a line behind it. To draw a shape we must “walk” that shape.

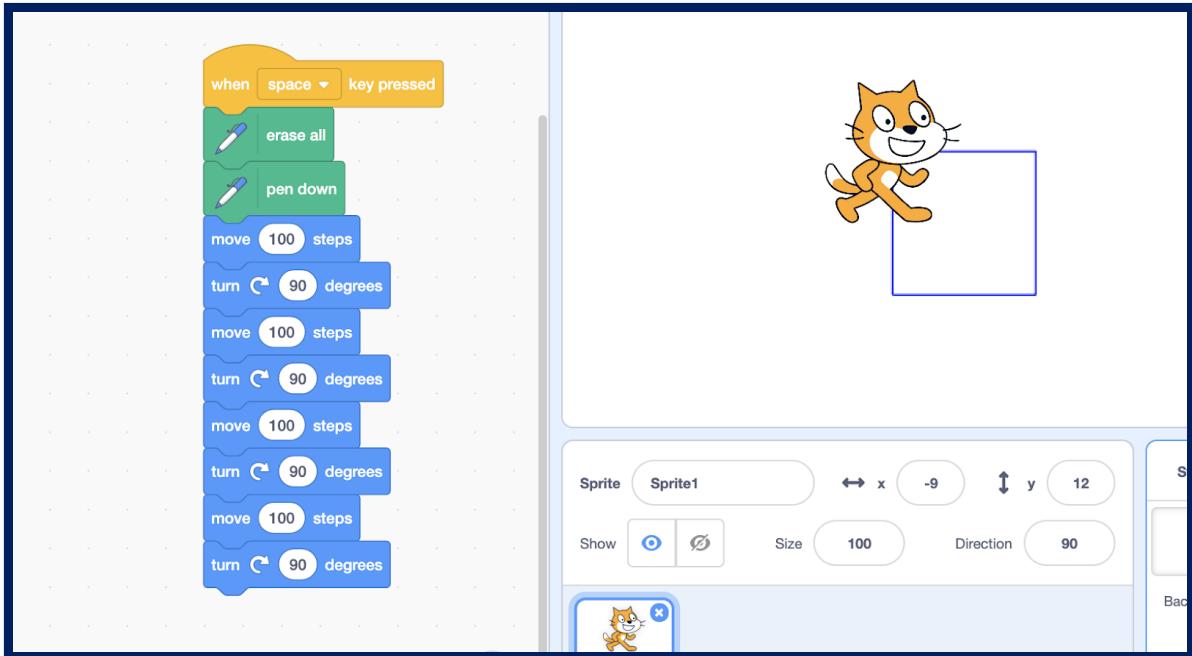
One of the best ways to explain this to children is to have them give instructions to a partner to walk a square in the classroom. You could try this now in pairs or someone could give the tutor instructions to walk a square. It is a good way of showing that each instruction must be implicit. It is no good to say “turn 90 degrees”, you would need to say “turn 90 degrees clockwise”

The Pen Palette, found under extensions, contains the blocks we will use for drawing.

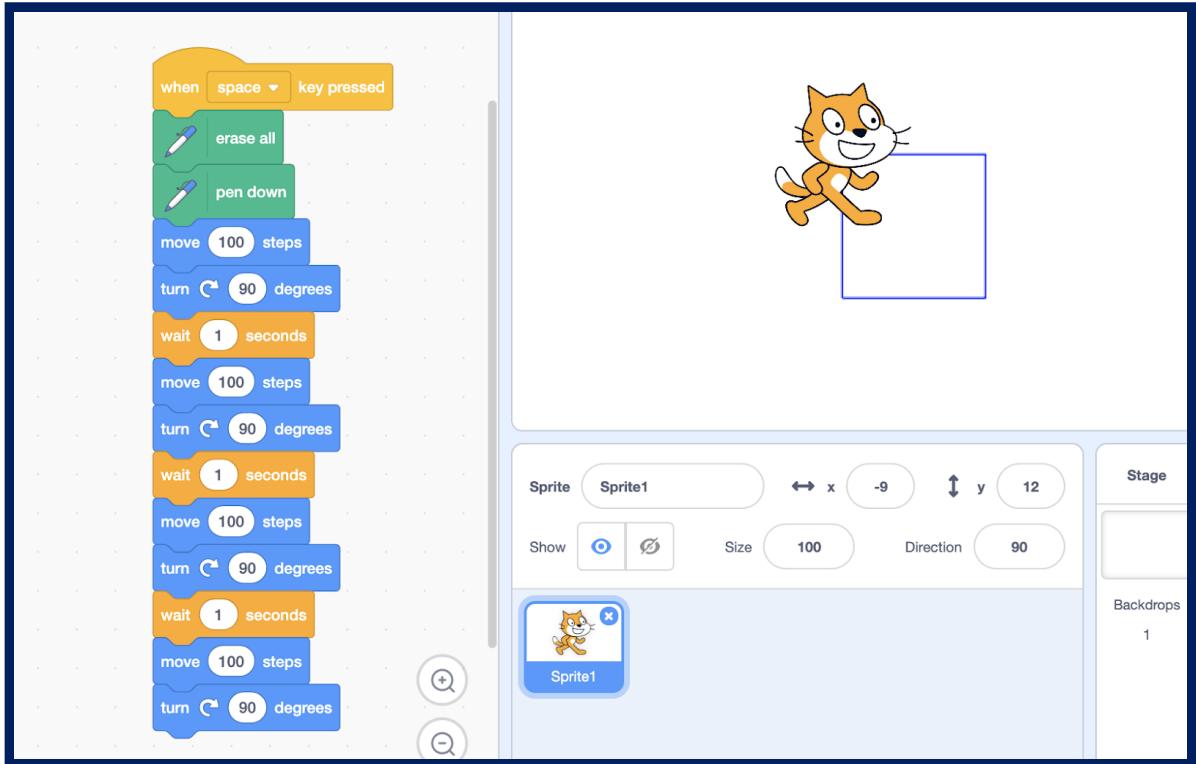
Participant Activity - Draw a square

1. Use an Events block.

2. Add the “pen down” block.
3. Using the Motion Palette, walk the sprite in a square.

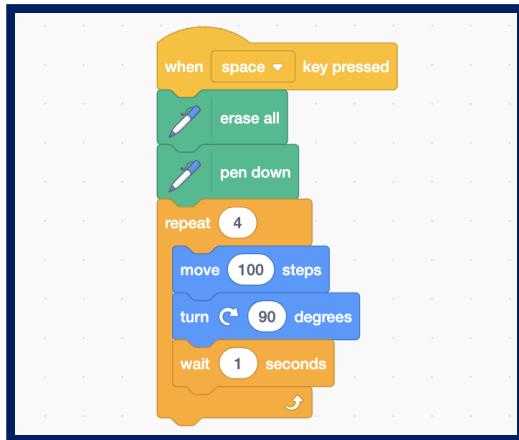


4. Add a wait block to slow down the script.
5. You could get your sprite to hide at the end so that you can see the square



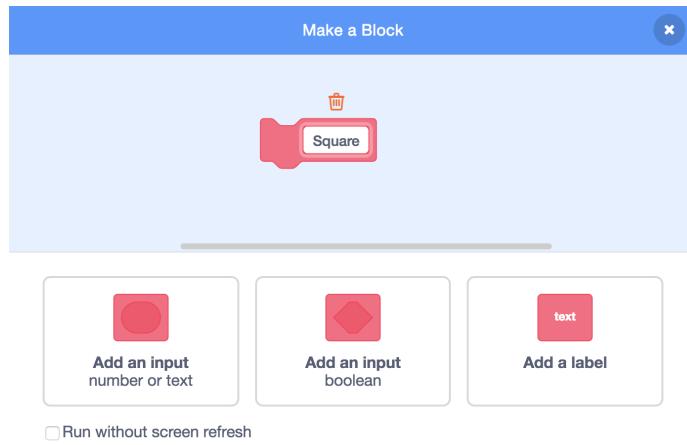
6. Save this project as “Square”.

Did you notice this code is repetitive (Because the movements and turns are all equal)? In Scratch we can use a repeat loop to create a shorter piece of code.

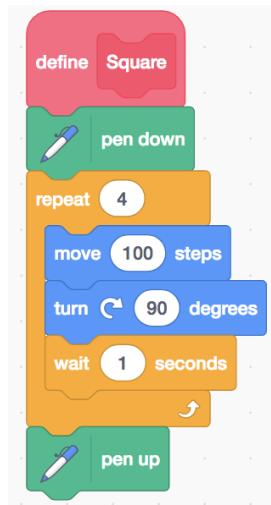


This is a good opportunity to introduce a facility in Scratch 3.0 where you can build your own programming blocks. We can create a block called ‘Square’ so that any time we use that block it will draw a square.

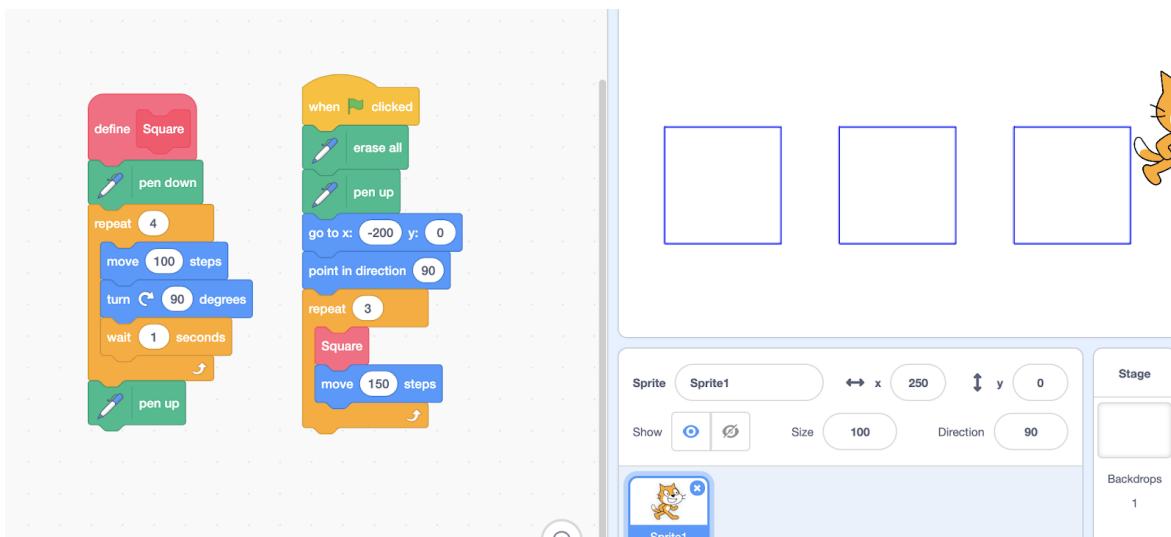
Under the My Blocks palette select the Make a Block button and call it ‘square’



Now you can define square



Now any time a sprite uses the new square block it will draw a square. For example if I wanted my sprite to draw 3 squares in a row I could use the following code:



Participant activity

Try the code above to create a square block. Experiment by drawing a different colour or pen size. When you have that done see if you can create a block called 'circle', 'triangle', 'pentagon' or 'hexagon'.

The blocks above are good for creating 2D shapes that are the same size but what if you wanted to create squares of varying sizes. You can overcome this by creating your block differently. This time when you create the square block select the option button below and add 'Add number input'.

Make a Block

Square **number 1**

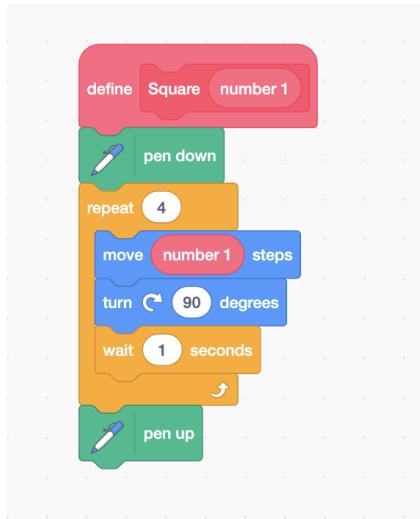
Run without screen refresh

Add an input number or text

Add an input boolean

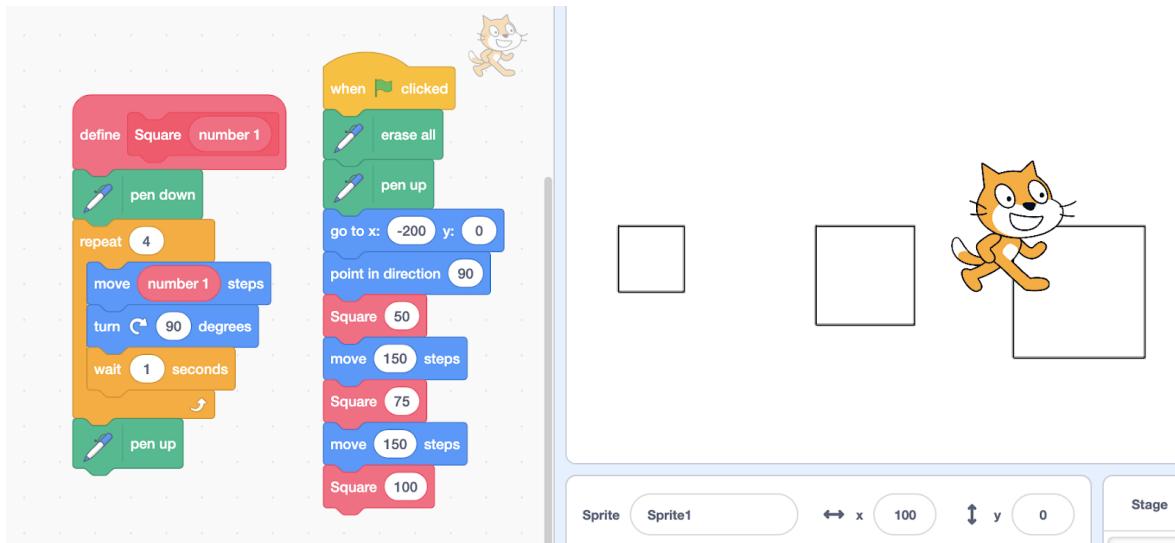
Add a label

We now change the square block as follows:



Notice how instead of telling the sprite to move 100 steps we drag down the 'number1' variable.

Now when we call the square block we have to add in a number. This specifies the size of the square. We can now draw 3 square of different sizes by entering the following code:



Participant Activity – Creating modern art

Create a piece of modern art by getting a sprite to create 2D shapes around the screen. You could incorporate the random function or even a forever loop so

that the sprite draws continuously. Share your project in the group studio.

Participant Activity – Draw a 2D house

Can you use Scratch to draw a 2D house? You could include a door, a window and a triangular roof.

If time permits you could complete another drawing activity:

Participant Activity – 2D shapes

1. Go to www.scratch.ie or to where you have saved the downloaded lessons.
2. Open Lesson Plan 5 – In the Garden.
3. Complete Challenge Time 1

When the basic shapes are mastered, you can make patterns by using repetitions.

Participant Activity – Repetition

1. Go to www.scratch.ie or to where you have saved the downloaded lessons.
2. Open Lesson Plan 5 – In the Garden.
3. Complete Challenge Time 2. If time allows continue to the Ultimate Challenge.

Discussion Time

Today's objectives were to cover:

Exploring numeracy in Scratch

Problem Solving

Drawing in Scratch

Discussion Time

Discuss the day with your colleagues and reflect on what you have learned. Discuss aspects of Scratch that are relevant to numeracy. How could Scratch be used as part of the Visual Arts curriculum? What could you use in your classroom if you were teaching tomorrow? Does anyone have anything to demonstrate to the group?

Module 4

ScRATcH



Module 4

Suggested Duration of Module

4 Hours

Objectives

Module 4 will cover:

Internet Safety and Cyberbullying

Scoilnet and World Book Online

Quizzes in Scratch

Scratch and External Devices

Discussion Time

N.B. If you have an iPad or an Android tablet please bring it in tomorrow to explore the ScratchJr app.

Internet Safety and Cyberbullying

The purpose of this section is to provide an overview of internet safety and its importance in the classroom context. It also looks at the issue of cyber bullying.

Webwise

The Webwise Primary School programme has been developed for primary school teachers who wish to introduce internet safety into their teaching of the Social Personal and Health Education (SPHE) curriculum.

The first part of the resource focuses on skills needed for surfing the web such as effective and safe searching, downloading images and determining what online content can be trusted.

The second section deals with the skills required to safely and effectively communicate online or by text message. It deals with issues relating to sharing personal information online, treating others with respect, cyberbullying, responding to media, in particular digital media and dealing with spam.

The Webwise programme utilises a range of teaching methodologies with particular emphasis on active learning, the principal learning and teaching approach recommended for SPHE.

Webwise's newest resource, "HTML Heroes", introduces 3rd and 4th class pupils to the internet with the help of two USB characters (Archie and Ruby). The animations and supporting lessons were launched as part of Webwise's work to raise awareness of Safer Internet Day 2019 and to promote the importance of online safety with parents, teachers and young people.

The HTML Heroes Programme comprises of eight lessons and three specially designed animations for use in the classroom. The resource introduces students to the internet, explains how it works and addresses key online safety topics including privacy, cyberbullying and evaluating information online. The resource also addresses growing concerns about technology and the use of devices such as screen time, online gaming, online advertising and social media.

The MySelfie anti-cyberbullying programme: provides opportunities for cross-curricular integration in particular with Drama, Language and Visual Arts.

It is made up of paper-based classroom activities and digital interactive lessons. The interactive cartoons are designed to be used as a whole-class activity using a whiteboard or digital projector. The activities may also be set up for a pair, an individual, or a small group to use at a classroom computer.

Useful Links

Webwise

<http://www.webwise.ie>

Webwise – MySelfie

<http://www.webwise.ie/teachers/myselfie>

Webwise

<https://www.webwise.ie/html-heroes/>

Social Media Advice for Teachers

<https://www.webwise.ie/teachers/social-networking-advice-for-teachers-2/>

Common Sense Media

<http://www.commonsensemedia.org/educators/cyberbullying-toolkit>

Better Internet For Kids

<https://www.betterinternetforkids.eu/web/portal/resources>

Childnet International resources

<http://www.childnet.com/RESOURCES>

Age appropriate lessons on internet safety

<https://www.thinkuknow.co.uk/>

Cybersmile - Advice on Cyberbullying

<http://www.cybersmile.org/advice-help>

The Scratch Community Guidelines for the scratch.mit.edu website and community can be viewed here: http://scratch.mit.edu/community_guidelines/

Scoilnet and World Book Online

Tutors will introduce some of free digital technology resources available, which may be useful in the context of Scratch and are developed or supported by PDST Technology in Education.

Scoilnet <https://www.scoilnet.ie/>

World Book <http://www.worldbookonline.com/>

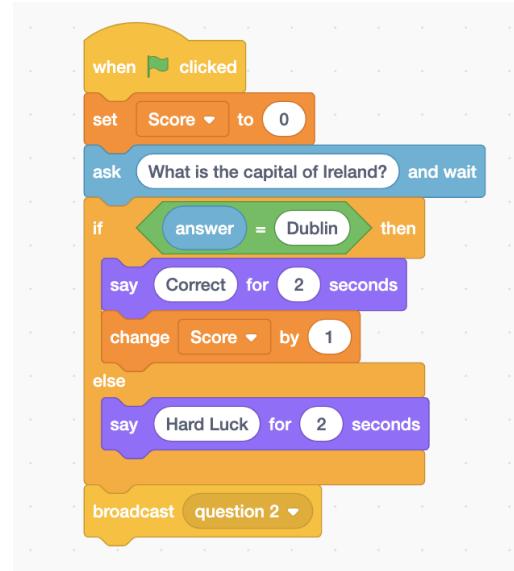
Quizzes in Scratch

Quizzes are a useful way of integrating Scratch across the curriculum. For example, when pupils finish a task in history, ask them to create a quiz for their peers. While developing the children’s coding skills, this task also demonstrates their knowledge of the history topic. Please check out this example quiz at <http://scratch.mit.edu/projects/18742762>.

Participant Activity

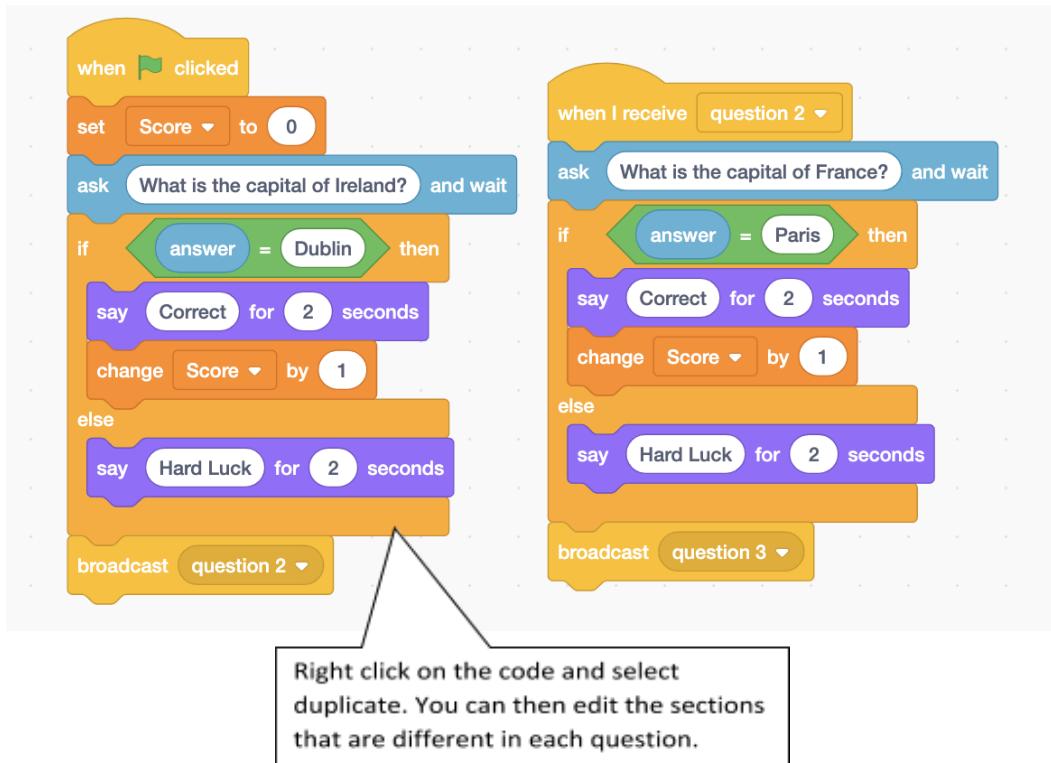
1. Decide on a topic for your quiz. This example is based on capital cities.
2. Select a sprite as your quizmaster.
3. Choose a background.
4. Because the quiz requires user input, we must use the blue “ask” block and the blue “answer” block. These are in the Sensing Palette.
5. When the code runs it should ask the question and wait for the answer. It should then react to signify if the answer is correct or incorrect.

Variable can be omitted for younger children.



```
when green flag clicked
set Score to [0]
ask [What is the capital of Ireland?] and wait
if [answer] = [Dublin] then
  say [Correct] for [2] seconds
  change Score by [1]
else
  say [Hard Luck] for [2] seconds
broadcast [question 2]
```

6. The code for any further questions follows the same pattern.

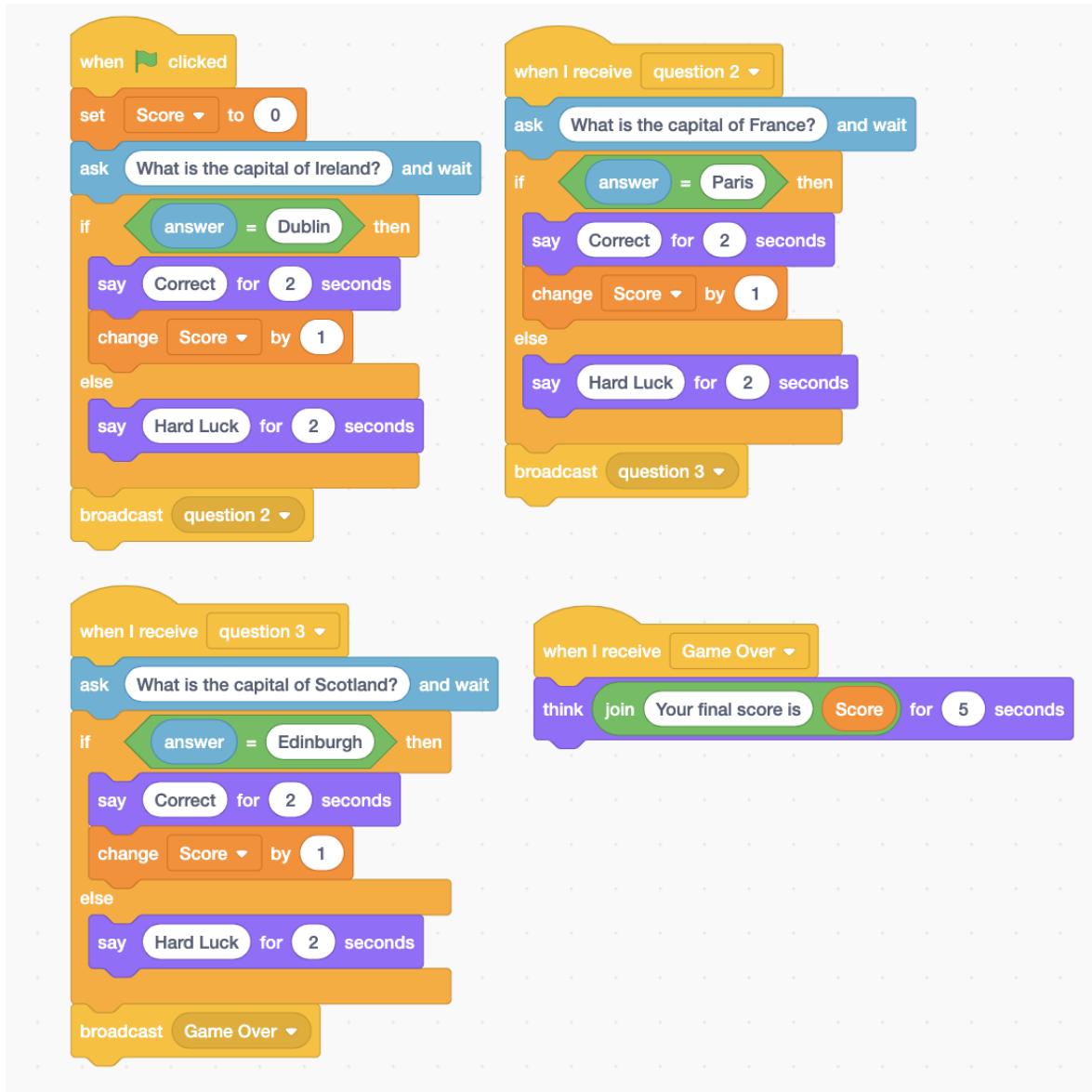


```
when green flag clicked
set Score to [0]
ask [What is the capital of Ireland?] and wait
if [answer] = [Dublin] then
  say [Correct] for [2] seconds
  change Score by [1]
else
  say [Hard Luck] for [2] seconds
broadcast [question 2]

when I receive [question 2]
ask [What is the capital of France?] and wait
if [answer] = [Paris] then
  say [Correct] for [2] seconds
  change Score by [1]
else
  say [Hard Luck] for [2] seconds
broadcast [question 3]
```

Right click on the code and select duplicate. You can then edit the sections that are different in each question.

7. The quiz can have any amount of questions. To end the game, you can display the user's score or you could change backdrop.



8. Increase the challenge by repeating questions that are answered incorrectly. Add in sound effects when questions are answered. Change backdrops for each question.

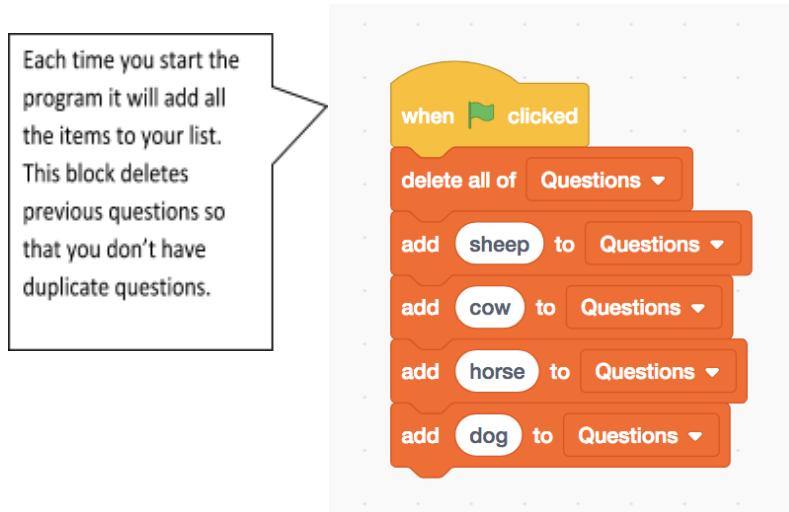
Lists in Scratch

A list or array is a way of storing several variables. It can be used in many ways but here we will use it to create a quiz. Lists can be quite challenging and therefore more suited to older classes.

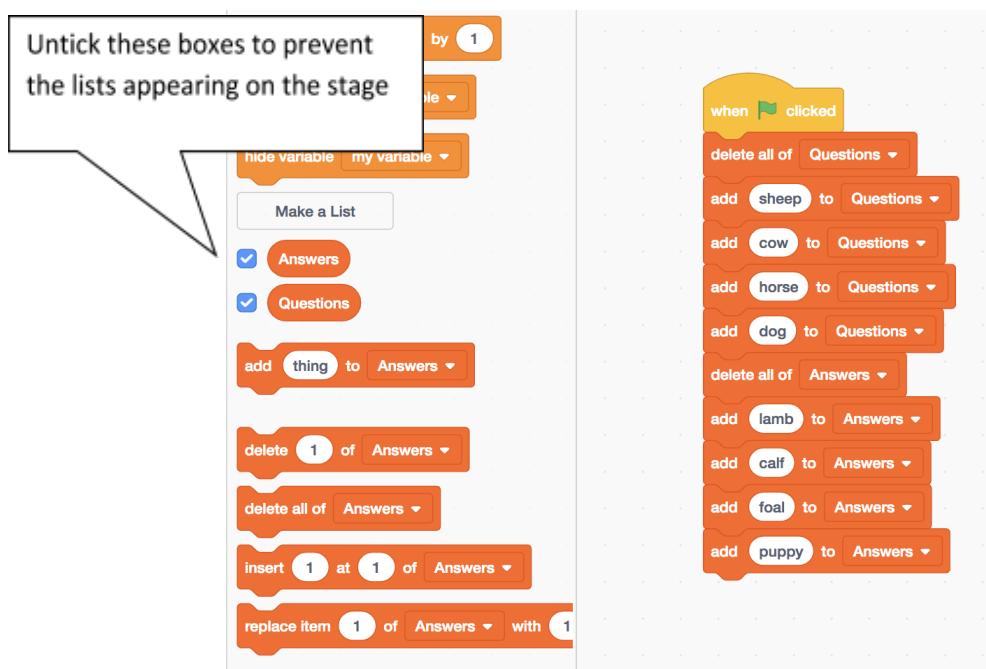
Participant Activity

1. Select a sprite

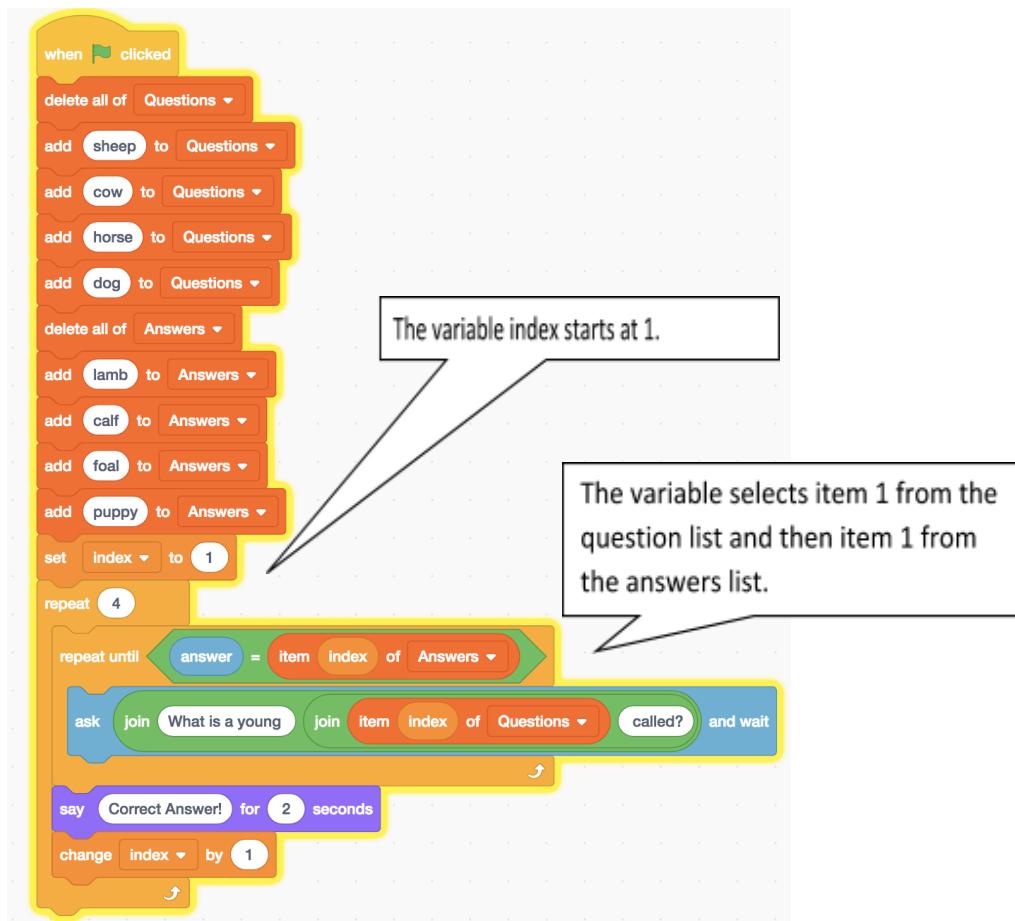
2. Select a topic for your quiz e.g. young animals. Decide on your questions. It is better if your question has a one word answer as users must get it exactly correct.
3. Create a list. Give it a meaningful name e.g. Questions.
4. For the list just enter the part of the sentence that changes. For example, instead of entering “What is a young sheep called?”, “What is a young cow called?” simply enter “sheep”, “cow”.



5. Create a second list called Answers. Enter the solutions to your questions. It is very important that the order of the two lists matches e.g. if sheep is your first question, lamb must be your first answer.

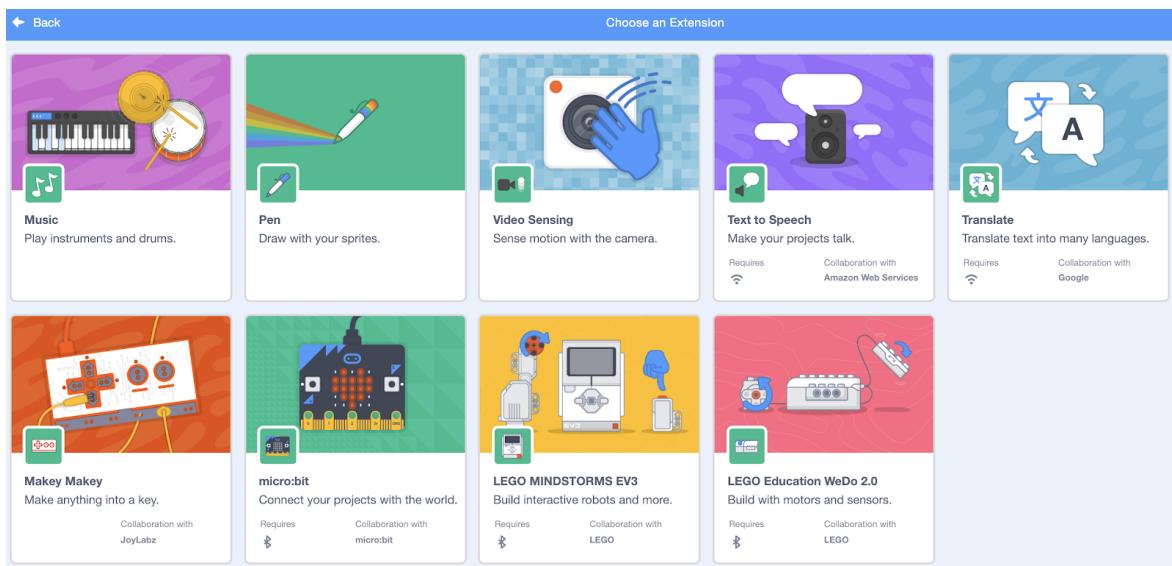


6. Now we must code to ask the question and to ensure the programme associates the question with its correct answer. We will create a variable index used to access particular elements in the list.



Scratch and external devices

If you are using the online version of Scratch it is possible to connect external devices to Scratch via the usb port and allow these to interact with the sprites. The devices can be used to operate the sprites but the sprites can also be used to operate the devices. The extensions that Scratch offer support for are Lego WeDo2.0, Lego Mindstorms EV3, micro:bit and Makey Makey. The tutor will demonstrate a video that shows Scratch interacting with Lego WeDo kits. If a kit is available the tutor will show a brief demonstration of how to connect Lego WeDo with Scratch.



Further information about using Lego WeDo with Scratch can be found here:
https://en.scratch-wiki.info/wiki/LEGO%C2%AE_WeDo_Construction_Set

Participant Activity

If Lego WeDo kits are available in your venue, create a Scratch project that interacts with a combination of the motor, distance sensor and tilt sensor.

Discussion time

Today's objective was to cover:

Internet Safety and Cyberbullying

Scoilnet and World Book Online

Quizzes in Scratch

Discussion Time

Module 5

SCRATCH



Module 5

Suggested Duration of Module

4 Hours

Objectives

Content of Module 5:

Digital Learning Framework and DL Plan

Other Digital Technology Resources from PDST Technology in Education

Create a Scratch Project

Support for Teaching Scratch

Other programming Resources

The Digital Learning Framework

The <https://www.dlplanning.ie/> website contains a number of useful resources to assist schools in developing their Digital Learning Plan, from the Digital Learning Planning Guidelines and Framework to video exemplars linked to the Framework highlighting how teachers are integrating digital technologies in their classrooms.

The purpose of this section is to provide an overview of the benefits of planning for the integration of digital technologies in the primary classroom. It also includes links to a number of useful resources to assist schools in developing their Digital Learning Plan.

Benefits

The benefits of using a school Digital Learning plan include:

- Assessing where the school is in terms of digital technology development and where it would like to be
- Identifying the digital technologies, software and skills available in the school
- Ensuring an agreed vision for digital technologies within the school aligned with the Whole School plan
- Allowing the school to integrate digital technologies more effectively into their teaching, learning and assessment activities based on the particular circumstances of the school
- Identifying targets to integrate digital technologies more effectively into teaching, learning and assessment.

Participant Activity

Using the [template](#) provided , develop an Digital Learning Action Plan for your class for the first term of the school year.

Tips

- Aim to ensure that the Digital Learning team includes a range of digital technologies skills and proficiency reflective of the staff as a whole.
- Be realistic. Look at what tasks will be attainable by the staff as a whole. Once this has been achieved, you can start on the next goal.
- The journey of a thousand miles starts with a single step!

Useful Links

[The Digital Learning Framework](#)

[The Digital Learning Planning Guidelines](#)

[The Digital Learning Framework Video Exemplars](#)

[The Digital Learning Plan Template](#)

Create a Scratch Project

Break into groups of 2 or 3.

Plan out a project.

Build it in Scratch.

Be as creative as you can. Use the resources you have seen throughout the week.

Incorporate the following into your project:

At least two sprites

Costume or Background Change

Broadcast

Variable

Images and sounds

Numeracy aspect

Upload your project to scratch.mit.edu.

Present your project to the Group

Present your project to the group.

Get feedback on your project.

Implement a new and improved version of your project

Create a version 2 of your Scratch project by adding some new features or functionality.

Support for Teaching Scratch

ScratchEd

<http://scratched.gse.harvard.edu/>

Launched in July 2009, ScratchEd is an online community where Scratch educators share stories, exchange resources, ask questions, and find people. Since its launch, more than 7,500 educators from all around the world have joined the community, sharing hundreds of resources and engaging in thousands of discussions.

Participant Activity

In pairs or groups go to <http://scratched.gse.harvard.edu/> and find some resources suitable for your class. Discuss any other Scratch resources you find useful.

Discuss Scratch

<http://scratched.gse.harvard.edu/discussions>

Discuss Scratch is a forum section within <http://scratched.gse.harvard.edu/> . There are hundreds of discussions where you can find solutions to your Scratch questions or you can also start your own discussion. The discussions are categorised into various sections.

Participant Activity

Consider an aspect of Scratch you found particularly challenging this week. Search <http://scratched.gse.harvard.edu/discussions> for help with this topic. Create a small project that reinforces your learning on this topic *e.g.* if you found costume changes difficult create a project with one sprite who changes costume.

Other programming resources

There are other programming resources available to teachers.

CS First

CS First provides lesson plans and video materials to introduce students aged 9-14 to computer science using Scratch. The materials are thematic to attract students with varied interests. Each theme contains up to 10 hours of content across 8 learning activities. The materials are free and available online at www.cs-first.com/materials.

Teachers may request a free classroom pack (containing teacher and student resources) by registering a CS First class/club at their school www.cs-first.com/start-club.

Participant Task: Visit the Google CS First Materials page (<https://www.cs-first.com/materials>) and attempt the introductory lesson ***High Seas Activity***.

ScratchJr

There is a free ScratchJr app available that is suited to younger children. The app is available for both iPad and Android devices. The www.scratchjr.org/teach.html website has resources and lesson plans for teachers that wish to use the application with their class.

If you have access to an iPad or Android tablet install the free ScratchJr app and attempt one of the lesson plans available on their website.

Blockly

This has been developed by Google and is similar to Scratch. It works in a similar fashion to Scratch by dragging blocks. There are a series of challenges or games for children to complete. These can be accessed at the following link <https://blockly-games.appspot.com>

Bee-Bot

This is suitable for younger classes. It is a programmable robot that can move around the floor based on instructions input. The robot can be purchased online but there is also a free app available that can introduce basic programming to younger children.

Sphero

Using Sphero SPRK+ and the Sphero Education app, learn to code by drawing paths, using Scratch blocks, or writing your own JavaScript text programs.

<https://edu.sphero.com/>

Hour of Code

This is a yearly event that takes place that encourage people to learn how to code. There are many resources available on the website: <http://code.org/learn>

European Code Week

This is another annual event where schools commit to doing some coding during the week. Details are available on the website: <http://codeweek.eu/>

Today's objective was to cover:

Create a Scratch Project

Support for Teaching Scratch

Other Digital Technology Resources from PDST Technology in Education

The Digital Learning Framework