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SCRATCH

In the Classroom!

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Project 1 – Add, Subtract, Multiply & Divide

Mathematics *is the science of the study of numbers, shapes and patterns, dealing with the logic of quantity, shape and arrangement. It is the building block for everything in our daily lives including mobile devices, architecture, art, finance, engineering and sports.*

Mathematics is divided into three main branches:

- *Arithmetic*
- *Algebra*
- *Geometry*

This project will be based on:

Arithmetic	Algebra
which is about numbers and their basic operations of addition, subtraction, multiplication and division	the part of mathematics in which letters and other symbols are used to represent numbers and quantities in formulae and equations.

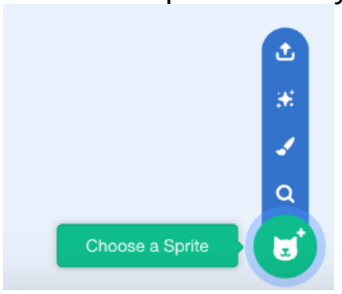
We will show the children how to build an interactive programme that will add and subtract numbers that are inputted. Then we will allow them the opportunity to enhance the programme by providing both a multiplication and a division element.

So let's start!

First upload Scratch

Delete the cat sprite.

Go to the Sprites Library  in



Select an appropriate sprite from the People folder such as

Position the sprite two thirds up from the bottom of the stage on the left-hand side.

If the sprite is facing the wrong direction (away from the rest of the stage), then go to *Costumes* and select Flip Horizontal.

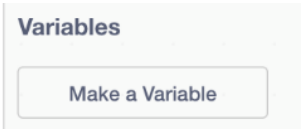
Now we start to build the script

Go to **Events** category and select the block 

Drag and drop into the **Scripts area** (also known as **Workspace**).

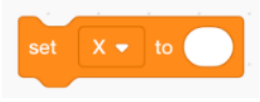
Go to the **Variables** folder.
Ensure that the children understand the definition of a variable in mathematics, namely a generalised representation of a value (number) that can change within the context of a mathematical formula. Typically, we use a single letter or symbol to represent a variable number. So we can use X and Y to represent the numbers that we are going to create.

In algebra, the use of letters such as X, Y, A, B helps us to generalise the formulas and rules that we write.

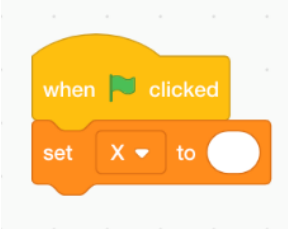
Select *Make a Variable* option 

Type in X under variable name and choose *For all sprites*.

The X box will appear in the workspace at the top left-hand corner under the Green Flag icon. Move it to the top right-hand corner of the screen.

Drag and drop 

into the Workspace under and connecting to the previous block



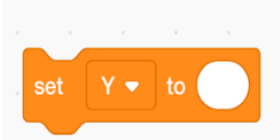
Make another variable

Follow the same procedure.

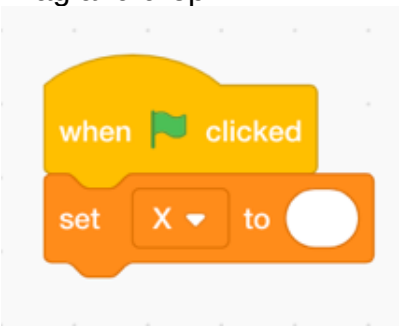
Once again select the *Make a Variable* option.

Type in Y under variable name and choose *For all sprites*.

The Y box will appear in the workspace at the top left hand corner under the Green Flag icon. If you have already moved the X box to the top right hand corner of the screen, repeat the process with the Y box and position it under the former.

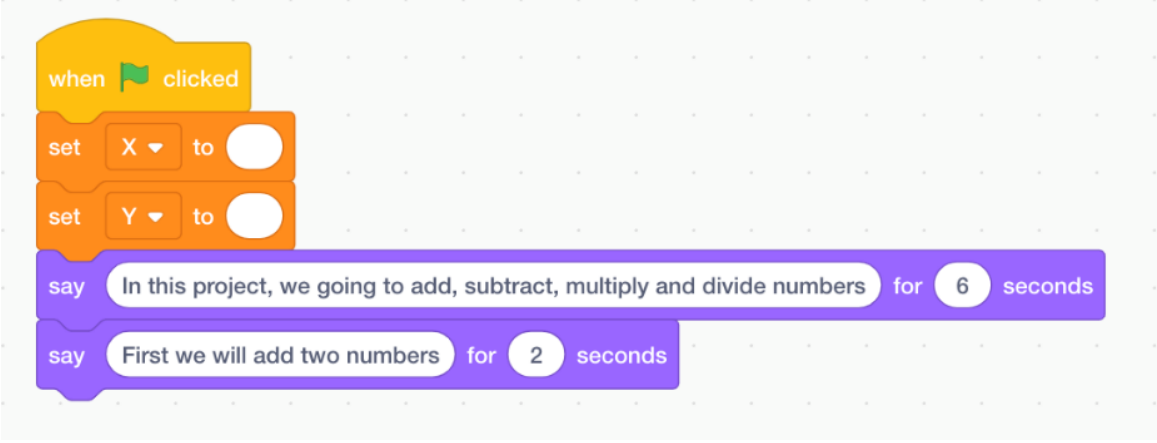
Drag and drop 

into the Workspace under the

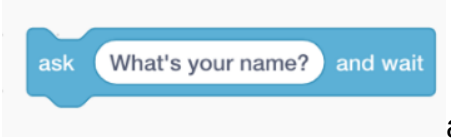


The sprite needs to say a few words to briefly explain what the project is all about.

Go to the **Looks** category, select the *Say* block twice, drop both blocks into the script and input a few words of introduction



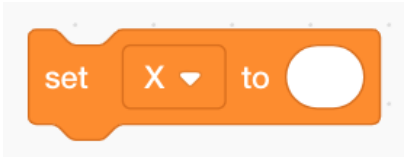
Go to the **Sensing** category.
This folder contains blocks of code that will allow the user to interact with the programme.

Select 

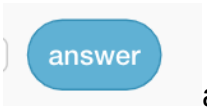
and drag and drop it to the script.

Type in the text *Input a number in the X box* into this block

Go to the Variable category

Select 

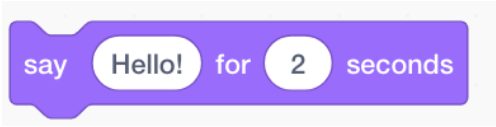
, Choose X from the drop-down menu and place this block at the bottom of the script

Go to Sensing, choose 

and place it into the white box of the aforementioned block

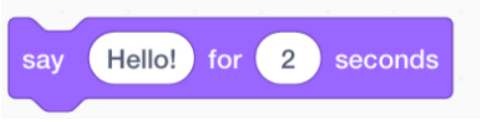
Repeat the process once again of *Ask* (Sensing) *Set* (Variable) and *Answer* (Sensing) blocks with the text this time stating *Input a number in the Y* box

When this is completed, go to the Looks category

Select and drop the 

block into the script.

Replace the word Hello! with *What is the addition of these two numbers*?

Place another 

from the Looks category at the bottom of the script. Increase the seconds from 2 to 3.

If you expect the children to answer verbally before it appears onscreen, then input a higher number.

We need now to locate a block that will allow the operation of addition between the two separate variables to take place

Thus, we go to the **Operators** category

Select 

and drop it into the first white box of the last Say block

Type into the first white box *The answer is*

Then go return to Operators, select the 

block and drop it into the second white box

Go to Variables, select 

and 

and place them appropriately into 

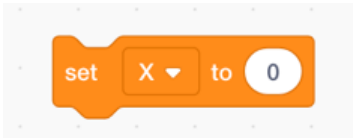
Increase the seconds from 2 to 4.

Go to full screen and press on the Green Flag icon

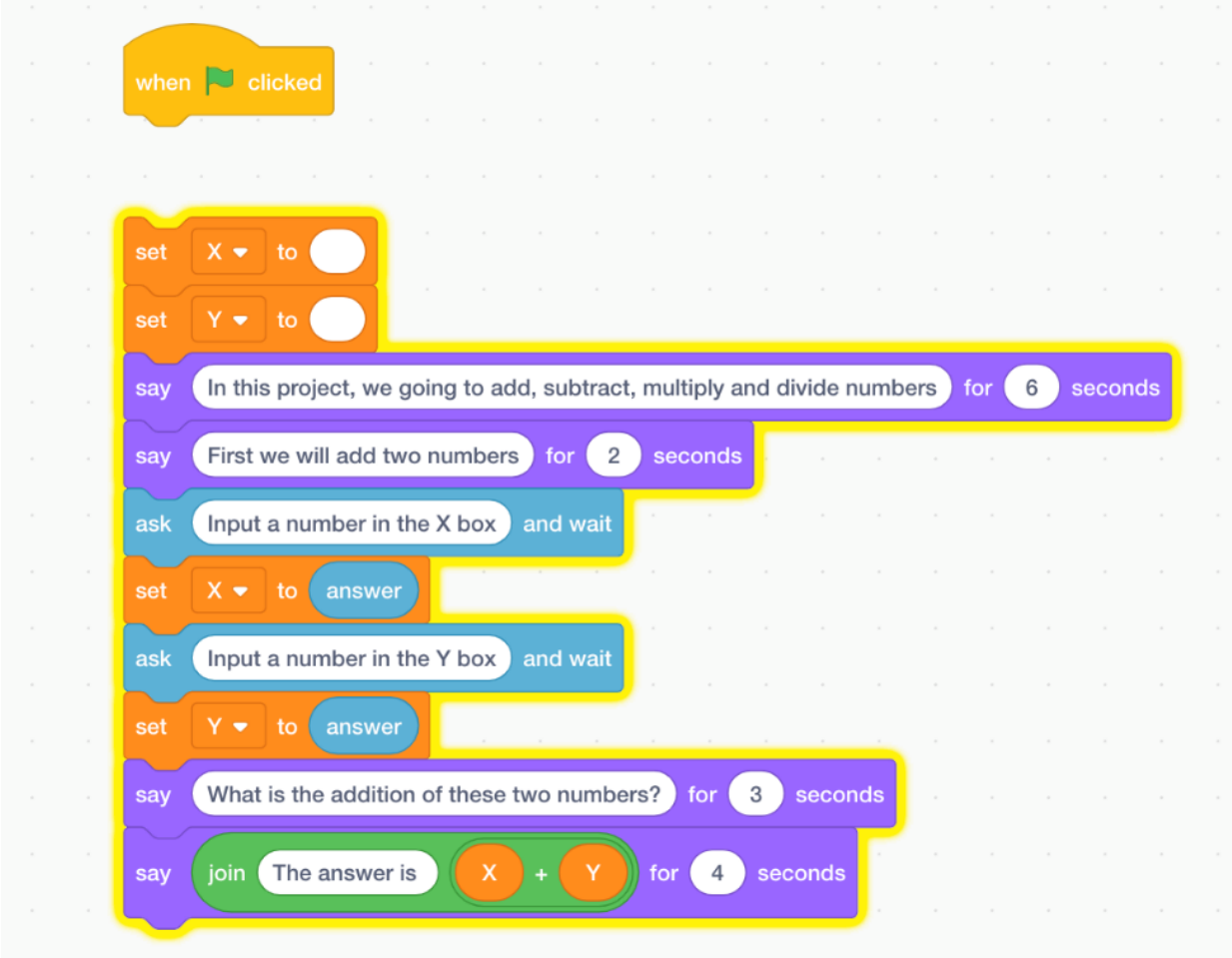
The first of four arithmetical operations has been included.
So save the programme by going to **File** in the top bar and choose the option **Save** to your computer in the drop down menu.

Give the file an appropriate name before saving

Now we move onto subtraction.

To do so, first we place the cursor onto the 

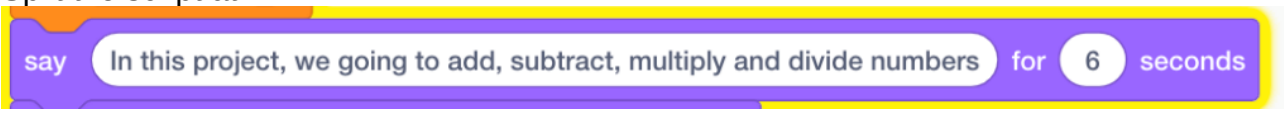
block.
Select the top left of the mouse or the relevant part of the keypad and drag slightly downwards. This separates the Green Flag from the rest of the script.



Hover over the disconnected large set of blocks, top right click on the mouse/keypad and select *duplicate*.

Re-connect the first sets of blocks to the Green Flag block and connect the new set of blocks to the end of the script.

Split the script at



and remove this specific block of code by dropping it anywhere in the **Blocks' Palette** area.

Replace it with 

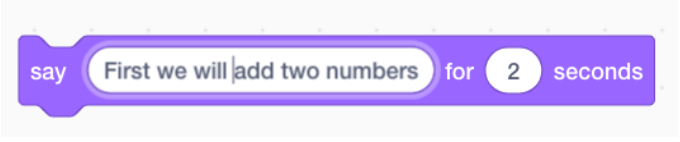
and reconnect the blocks into the script.

Change 1 to 2 in the block
Change the wording of the text *First we will add two numbers* to *Let's subtract!* (or similar text

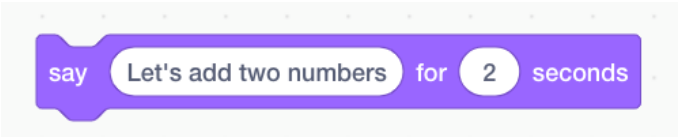
After the amendments have been completed, run the programme to see if it works.

However, as the exercise ends after the single subtraction is done, we can input a *Forever* loop so that the programme keeps on running.

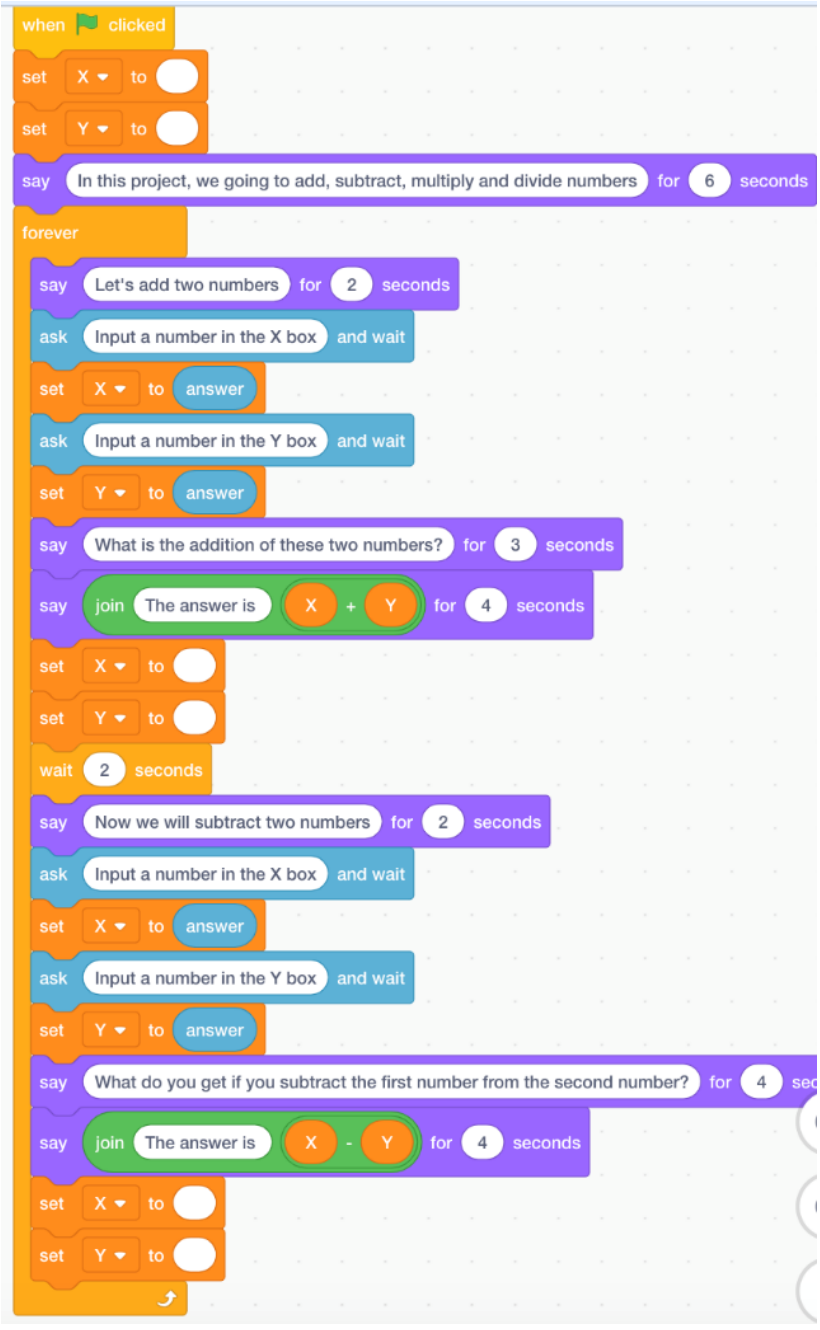
Before doing so change the text



to



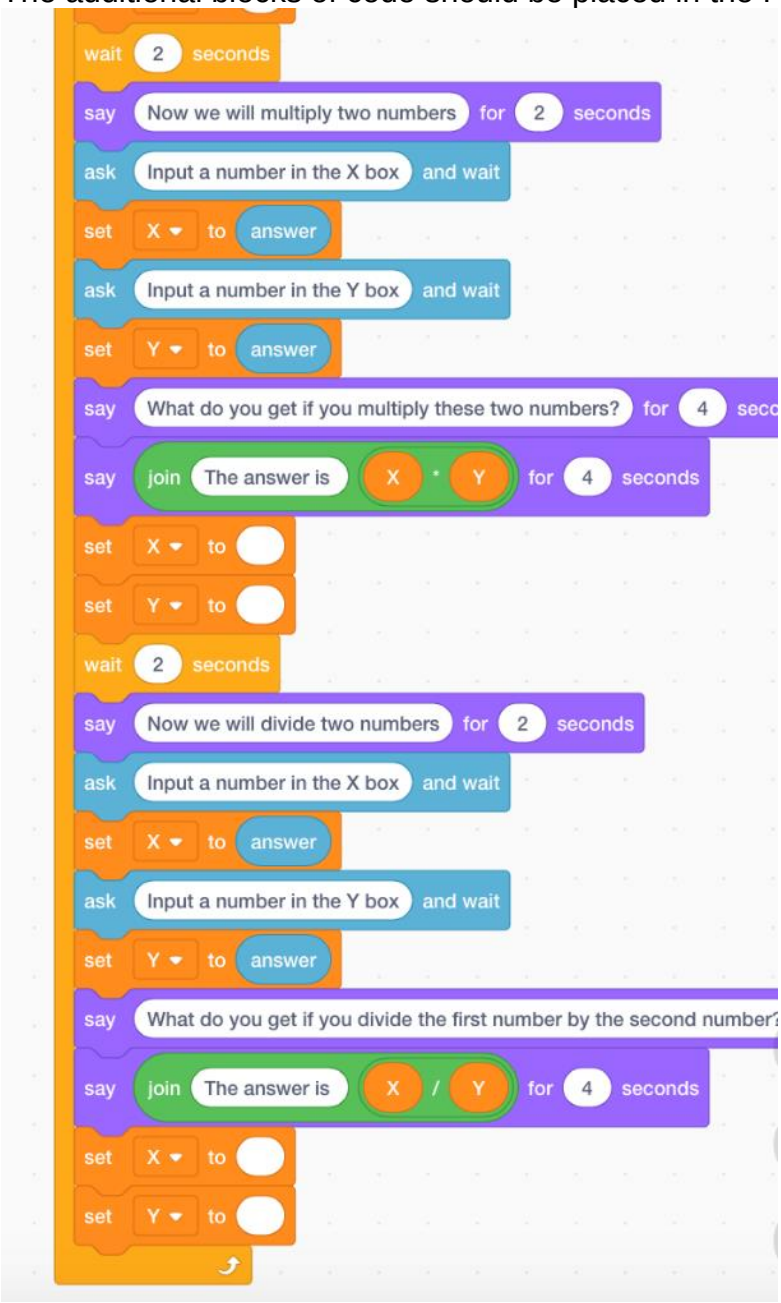
So that the narrative reads better in the script as below



If the script works fine, now is the time for the children to experiment.

If they are of sufficient age and level of knowledge, get them to undertake the operations of multiplication and division as part of the programme being enhanced. Tell them to revisit what they and you have done together before starting the process. Give them a period of time to complete the exercise.

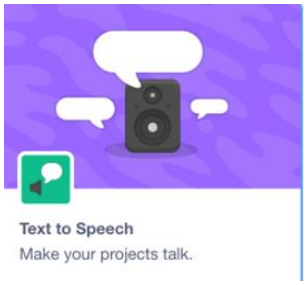
The additional blocks of code should be placed in the Forever loop and look similar to



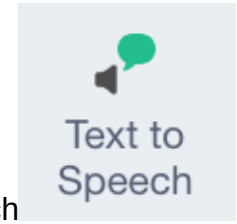
Once the time period is up, get one or more of the students, who have successfully completed the exercise, to come to the top of the class and explain step by step what they have done. If the classroom has an interactive whiteboard or a projector, get the volunteer(s) to guide the class through the process on the big screen.

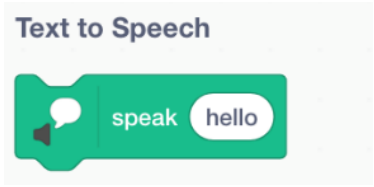
After these tasks are completed, as a novelty piece you can get the project to *talk*.

Click to the Addition icon located  at the bottom left hand corner of the Scratch Interface.



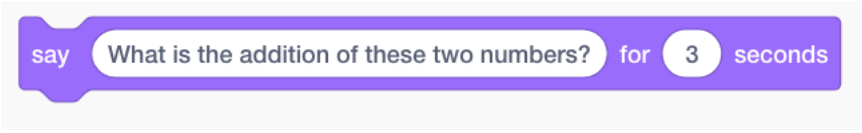
In the *Add Extension* that now appears, select *Text to Speech* and return to the Scratch Interface.

In Text to Speech 

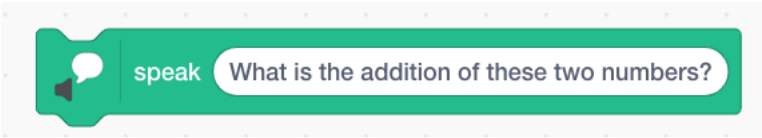
, select 

and replace Hello with *What is the addition of these two numbers*?

Change the set voice to and set language to that required.

Substitute 

with



in the script

Run the script.

This will obviously excite the children. However, it is best to leave the introduction of speech until the end of the class as it can become overused and whilst it will be great fun for the students it can be a very noisy distraction!

By the Way...

The completed project is located on the ACW Mentors Scratch account at https://scratch.mit.edu/projects/411572136/

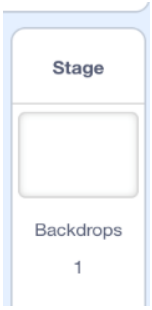
Project 2 - Building a Calculator

As a follow up from the last project which was based on coding a series of simple but powerful interactive arithmetic functionalities, this lesson will use Scratch to build a calculator to undertake addition, subtraction, multiplication and division.
It is most suitable for older pre-teens and teenagers.

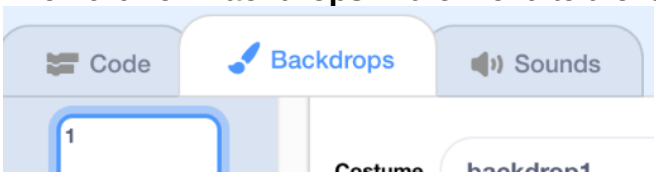
If you wish, the structure of this project will allow students the opportunity to learn from the tuition provided in the first part of this project so that they can, as an exercise, deduce what code would be required to make elements of the calculator operational that may not be activated by and with you as the instructor. In other words, you can guide them through coding the addition, subtraction and possibly multiplication and allow them then to independently undertake the division process.

To start, first select **New** under **File** in the **Menu** bar.

In the Scratch **User Interface**, go to **Backdrops** in the **Stage** section.



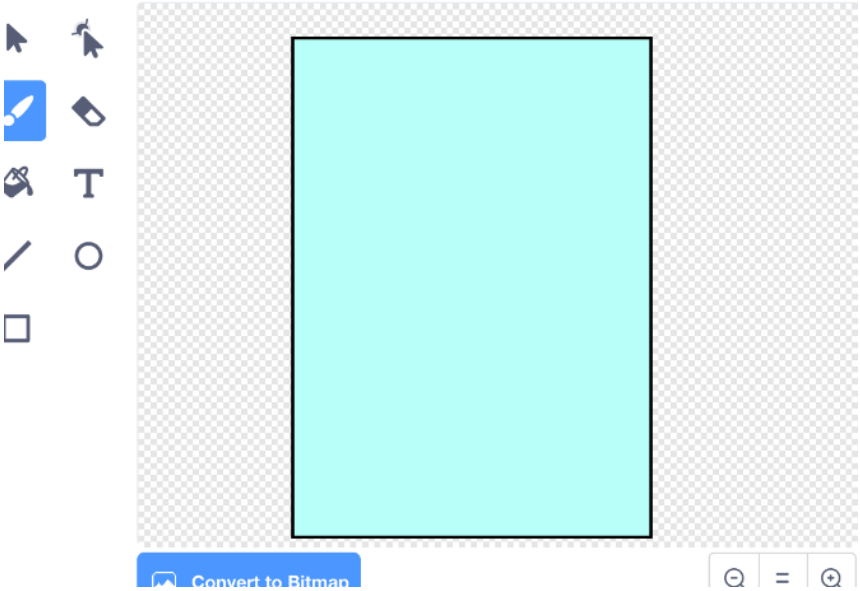
Then click on **Backdrops** in the menu to the left of the screen



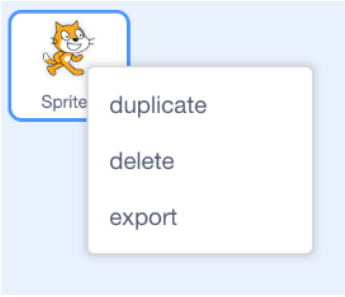
Then choose the rectangle icon in the **Tool Box**

and pick a suitable light colour

Starting on the top left-hand corner, drag the cursor out to approximately two thirds of the width of the stage and then down to the bottom. The rectangle will represent the outline of the calculator.



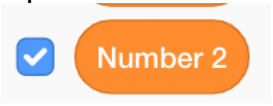
As the cat sprite is not required in this programme, remove it by hovering over its icon, right click on the mouse and select Delete.



We now go to the **Variable** category to create four different variables using the *Make a Variable* option.

The first will be labelled *Number 1* to represent the first number to be inputted on the calculator.

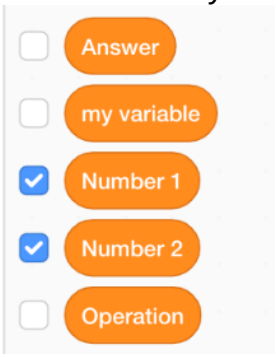
The second variable will be labelled *Number 2* to represent the second number to be inputted on the calculator.



The third variable will be labelled *Operation* to represent the actual action of addition, subtraction, multiplication or division that will take place between the two numbers.

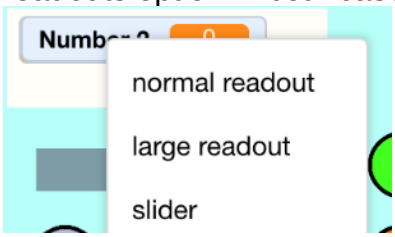
The fourth variable will be labelled *Answer* to represent the outcome of the mathematical action between the two numbers.

There is no need to have Operation and Answer on view to the user of the Calculator. So hide both by ticking on the appropriate blue boxes in the Variable category.

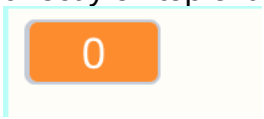


Furthermore the wording “Number 1” and “Number 2” are not required in their appearance on the Stage as we are only interested in the actual mathematical numbers that appear in the course of operations.

So separately right click over Number 1 and Number 2 sprites and select the large readouts option in both cases.



Then drag both towards the top left-hand side of the calculator design, dropping one directly on top of the other.



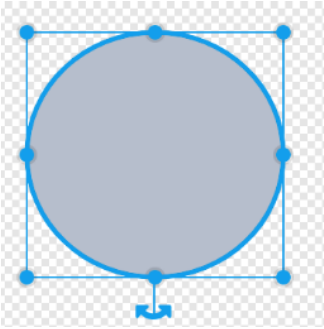
We now need to populate the calculator with the standard function keys including digits and mathematical operations.

To start the process, select the paint brush icon in the *Choose a Sprite* section.

Select the circle icon in the paint **Tool Box**.

Choose a colour, and should you wish, a border outline (second box) with its width controlled by adjusting the number in the third box below

Its size can be adjusted moving the blue lines



Position the sprite in the calculator background.

Duplicate the circle or key sprite twelve more times. Position the duplicates so that three columns of four and one column of five sprites are created.

Return to the first sprite and go to Costumes.

Select (T)ext in the Tool Box.

Choose a different colour

Then bring the cursor to the centre of the circle and input a number between 0 and 9.

Use the Reshape key to move the number to within the circle that you are happy with.

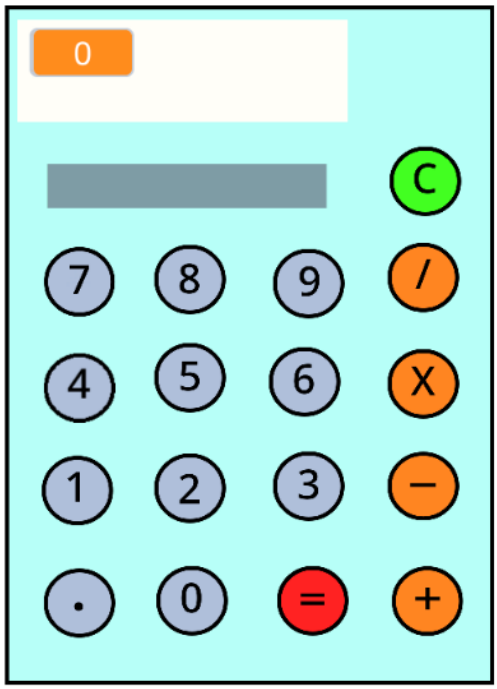
Repeat this process in each sprite until all numbers between 0 and 9 as well as a decimal point (full stop symbol) are inputted.

Copy the layout of a simple calculator when positioning each button icon.

For four of the sprites. select a new colour and input the symbols for addition, subtraction, multiplication and division.

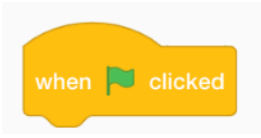
If you wish, chose a different colour for each of the last two keys (sprites), namely **=** and **C**(clear).
Position these key sprites as per your agreed layout.

Two small rectangle sprites can be positioned towards the top of the rectangle to give it an authentic calculator look.



The first step in building the script is to input the settings for the four variables, namely number 1, number 2, operation and answer, which will be placed in the **=** (equals) key sprite.

Go to **Events**

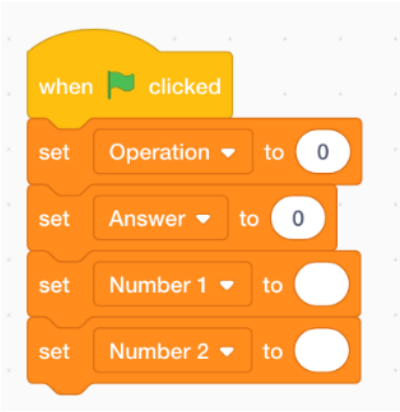
Drag and drop 

into the workspace

Go to **Variables** and drag and drop set operation, set answer, set number 1 and set number 2 blocks into the workspace connecting to the 

block.

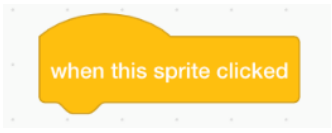
By default the value in these blocks will be 0 (zero).
But delete the zero in both Number 1 and Number 2 block as we want the number slot to show on the calculator as blank



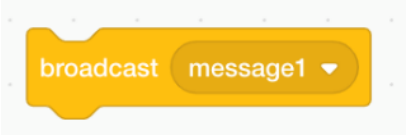
As we want the Number 1 input value always to appear first onscreen during the start of an operation, we have to initially hide the Number 2 variable.

This we achieve by using the *show variable* and *hide variable* blocks, placing them at the end of the current script and using Number 1 and Number 2 options from the drop-down menu.

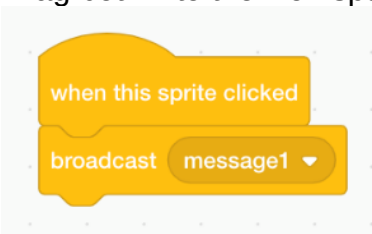
Now click on the sprite representing the digit **1** key

Go to the Control category, select 

and then



Drag both into the workspace and connect



The purpose of these two linked blocks of code is that when key 1 is pressed it sends a *broadcast* or *message* to another part of the programme to implement a change.

Repeat this process for all other nine digits (0 to 9) changing the label message1 to message2 to message3 and so forth.

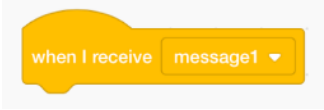
To do so just click on the message1 dropdown menu, select 

and type in the new name.

For a broadcast to work it has to have a corresponding I receive command somewhere else in the programme. In this case we will position these blocks in the workspace of the **Backdrop**.

Click on the Backdrops icon in the Stage section

We will start the process with message1

From Events, drag and drop 

What we want to happen in the programme is that when we click on Key 1, the number 1 will appear onscreen on the two occasions (first input and second input) involved in each operation of adding, subtracting, multiplying and dividing.

As each operation will involve two separate inputs of numbers, once in the Number 1 variable and once in the Number 2 variable, we have to ensure that the script can differentiate between both.

The script already inputted in the Backdrops **Scripts area (Workspace)** ensures that the digit 1 will always appear if it is the first (or part of) number clicked.
The second number selected should only appear on the calculator after an operation (add, subtract, multiply and divide) is started e.g. 3 (first number 1) + 4 (second number)

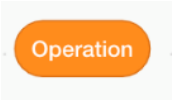
So to ensure that it appears before and after each operation when it is selected, go to Control and choose

As we have the operation variable already in the programme and set to a value of zero, we get the code to take cognisant of this.

Go to Operators category.

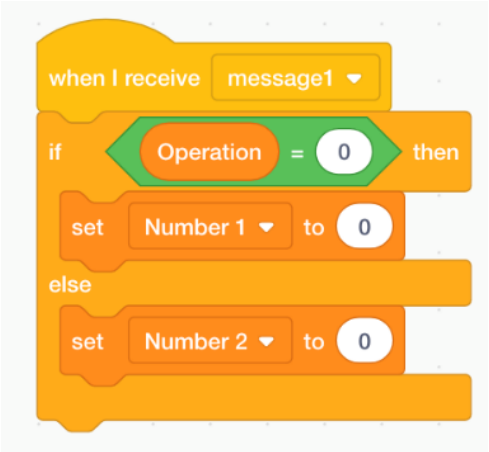
Select 

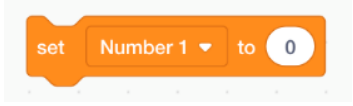
and place it between *if* _____ *then*.

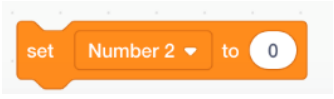
Place 

from the Variable category into the first white spacing and input the value 0 in the second white spacing.

Place set number 1 to and set number 2 into the script as follows



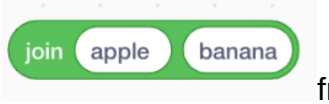
If we change the value in both 

and 

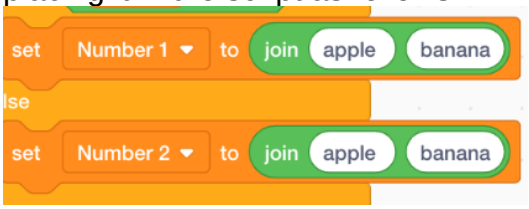
from 0 to 1, it means that when we click on the 

key on the calculator the digit 1 appears. But the script doesn't allow the multiple entry of 1 as in 11, 111, 1111 etc.

To achieve this, we have to have a script that will allow the joining of multiple entries of 1, as in for example 1 followed by 1 followed by 1 to give 111.

This we achieve by selecting 

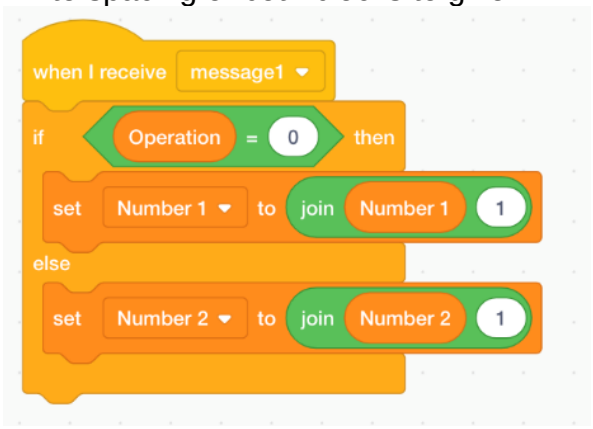
from the Operations category and placing it in the script as follows



Place 

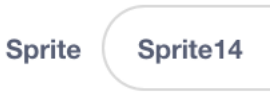
and 

in the first white spacing and the digit **1** in the second white spacing of both blocks to give

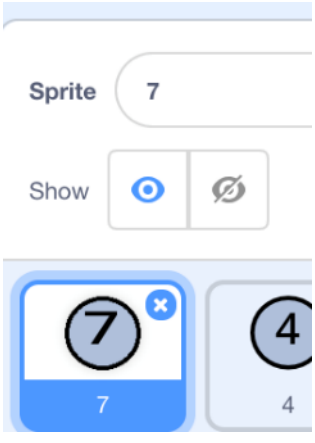


Duplicate this script nine times replacing the digit **1** with 0, 2, 3, 4 5, 6, 7, 8 and 9.

To help in simplying and understanding the role of each digit sprite, it is best to rename them.
This can be done by going to the label Sprite directly under the Stage on the left side



and change the name appropriately.



This renaming process applies not only to the digit sprites but to all sprites (+, -, = …).

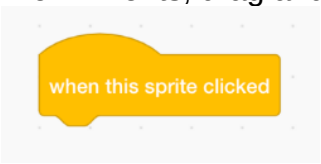
To activate the four operations of addition, subtraction, multiplication and division, we first need to enter a script in each of the appropriate four sprites.

To activate the four operations of addition, subtraction, multiplication and division, we first need to enter a script in each of the appropriate four sprites.

Click on the 

sprite

From Events, drag and drop



Then go to Variables.

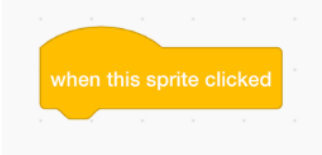
Select the block set *Operation to*_____ and input the text *add* and then connecting it to the previous block.

As the use of any of the four Operation keys takes place only after the clicking of Number 1, then we have to input code that will hide the Number 1 sprite whilst showing the Number 2 entry.

This is achieved by the addition of two further blocks from Variables to give the following script

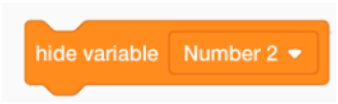
Repeat this process for the three other Operation sprites representing subtraction, multiplication and division. The easiest way to do this is to copy this script into the other four sprites and replace *add* with the appropriate word *subtract*, *multiply* and *divide*.

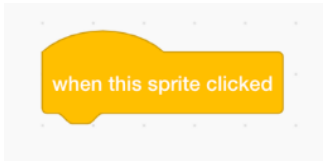
For the final part in activating the calculation process, we return to the **=** (equals) sprite.

Drag and drop 

from the Events into the workspace.

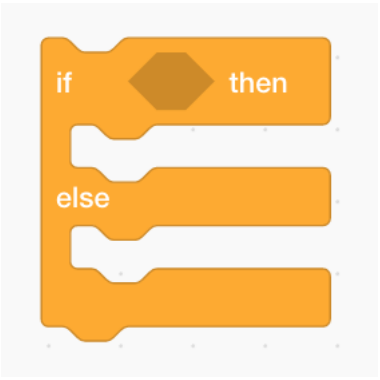
To show the mathematical result of the +, -, X or / action between the two numbers, we have to first hide the Number 2 entry which would be what is showing before the user clicks on the **=** (equals) key.

So place 

from Variable under the 

We commence the input of the four separate operations by starting with addition.

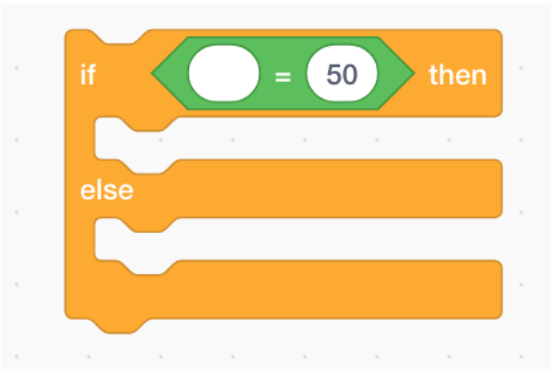
Go to **Controls** and select

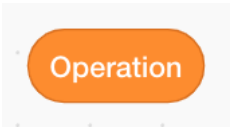


In **Operators**

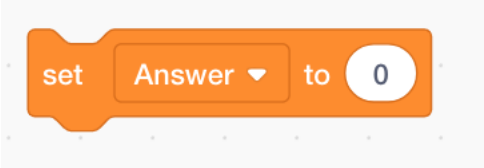
Take 

and place in the spacing between If and then



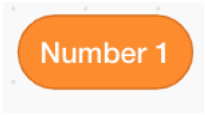
In **Variables** select 

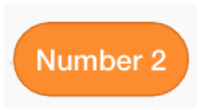
and then



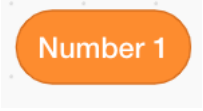
placing both separately in the script as follows

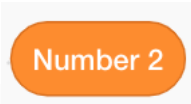
As the operation in this case will be addition, input the word *add* to where the number *50* is in the script.

As the answer will be the addition of 

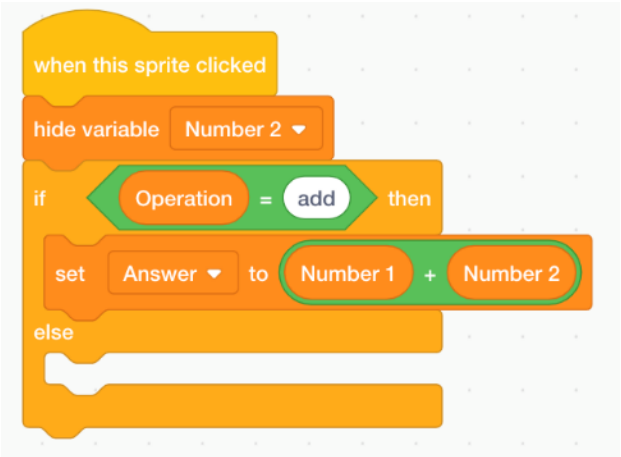
and 

, place from **Operators**, the addition (**+**) block 

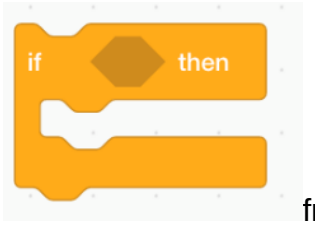
on top of the digit 0 and 

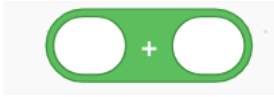
and 

in the white spaces between the + symbol.



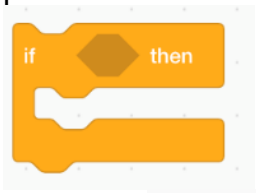
We now implement a similar coding for Subtraction

In the spacing below else in the script, place in the block 

from **Controls**.
Repeat the process for subtraction as was done with addition by using the word *subtract* instead of *add* and replacing 

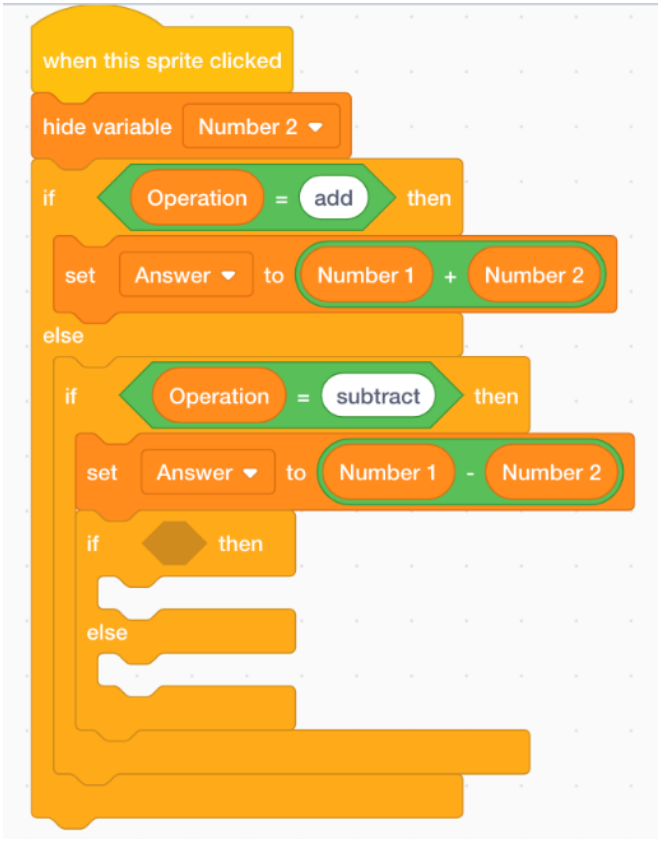
with 

Once this is completed,

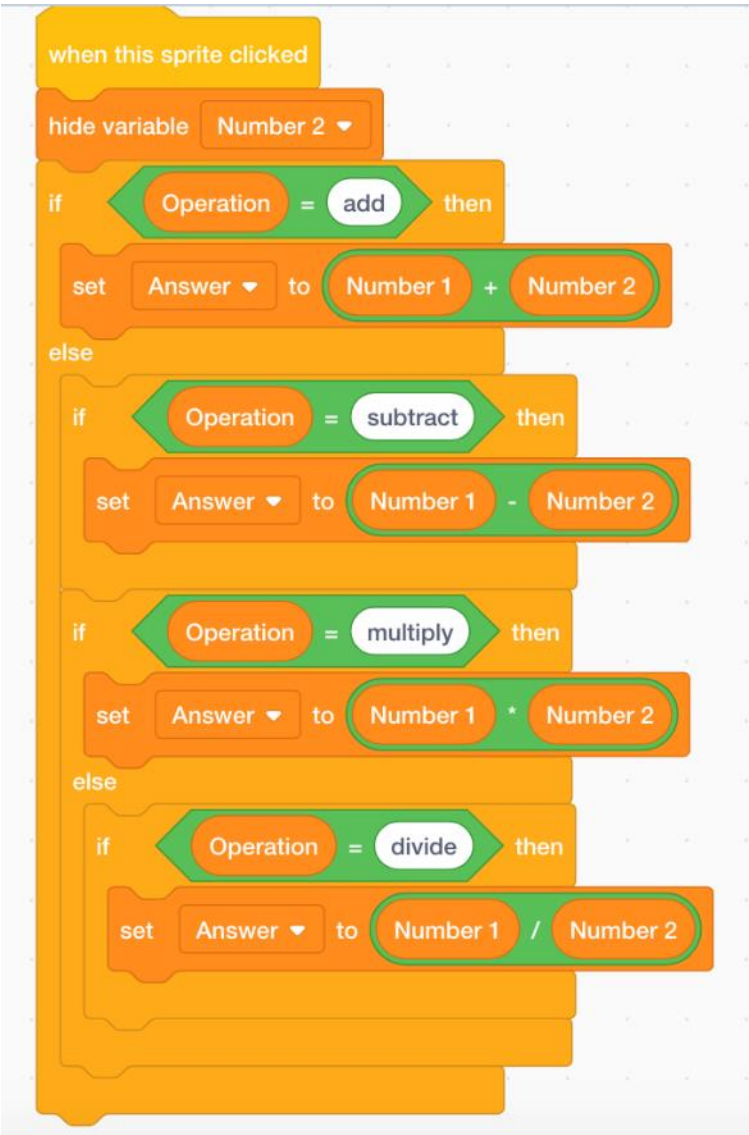
place 

under the 

to give:



Replicate the addition and subtraction operations for multiply and divide in the *if then_____else* block within the script.

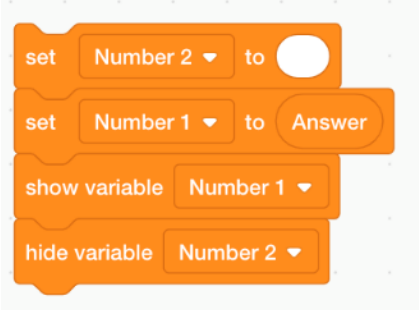


Click on the Green Flag to test the script.

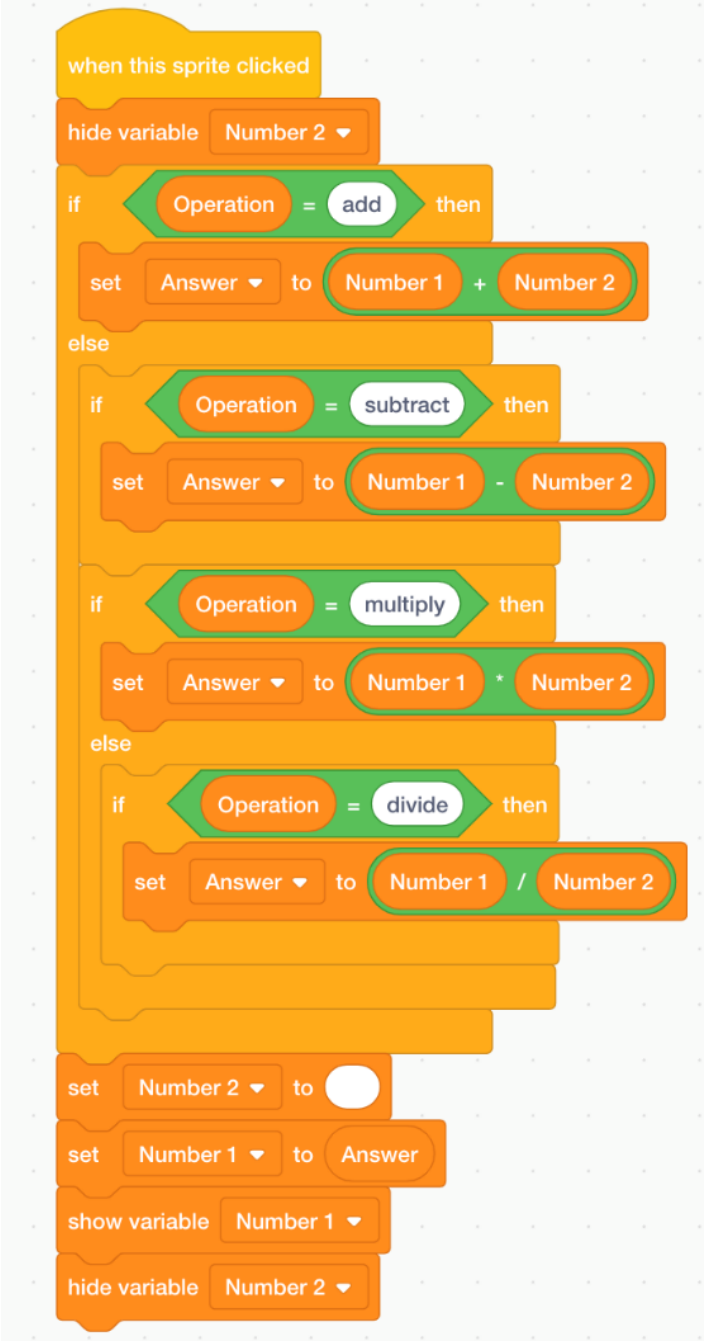
The programme does not yet work as it is unfinished.

For the answer to appear onscreen, we have to set the last number used (Number 2) to blank status (no numbers) and be hidden from view (hide variable) whilst having the other number (Number 1) become the answer and being seen on screen (show variable).

So attach the following blocks to the end of the other blocks



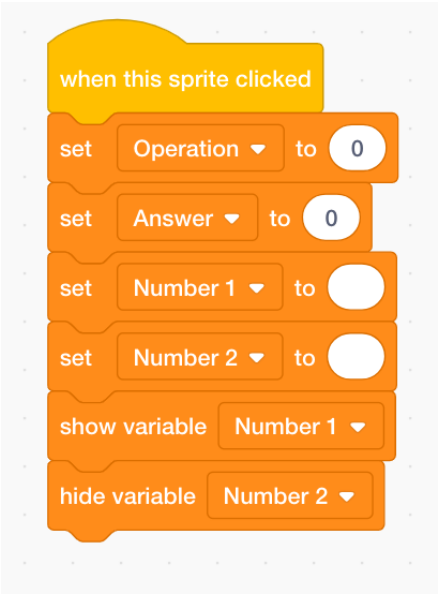
to give the following



The Clear Key
The last programming that needs to be done in order to complete this project is to create a script for the Clear key.

Clicking on the Clear key should have the same impact as clicking on the **Green Flag**, namely the **numbers display box** on the calculator should show as blank and that the Number 1 variable will be readied to be shown first when **any** number key is pressed.

So go to the workspace in the **Equal** symbol key sprite and select the script that commences with the Green Flag block. It was actually the first script that we entered in this project.



Drag and drop this script into the Clear (key) sprite.

The project is finished and ready to go!

By the Way...

The completed project is located on the ACW Mentors Scratch account at https://scratch.mit.edu/projects/411571246/

Project 3 - Drawing Shapes

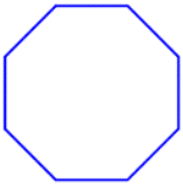
In this project students learn to understand how to draw shapes using a series of scripts.

The project will be based on:

Geometry

which is the branch of mathematics that deals with shapes and sizes of figures and their properties.
The basic elements of geometry are points, lines, angles, surfaces, and solids

What is a Polygon?



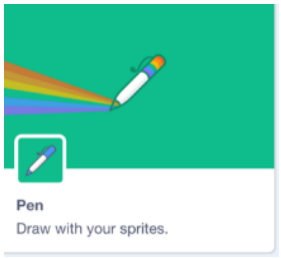
In geometry, a polygon is any two-dimensional shape formed with straight lines. The word polygon derives from the ancient Greek words for many (poly)and angle/corner (gon). Triangles, hexagons, pentagons, squares and rectangles are examples of polygons. Their names can often tell you how many sides the shape has, in for example a tri(three)angle and an octa(eight)gon.

However a circle is not a polygon as it does not have straight lines

In order to draw in Scratch, go to the **Pen** category.

However, as Pen is not one of the standard onscreen categories, we have to click on the *Addition* icon  located at the bottom left-hand corner of the Scratch **Interface**.

Under *Choose an Extension* click on

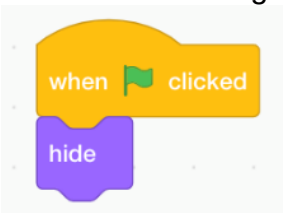


Then choose the Pen element which will automatically add it to the thematic block categories on the (Home) Interface.

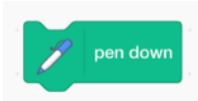
Creating a Script to draw a Square

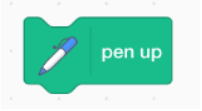
This time we do not need to use a sprite. But as all of the Scratch commands cannot function without a sprite, we need to hide it (rather than delete it).

Place the following commands in the Workspace to make the sprite disappear:



From Pen, select a pen size and colour.

We also have to give instructions for the pen to a) start 

and b) finish 

drawing.

It is also important to clear previous drawings from the stage area and to recommence the drawing process on a blank canvas once the Green Flag is selected to restart the project.

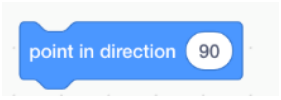
So, use the command 

Adding on *wait 1 secs* block from Control will allow the viewer to better appreciate visually both the commencement of the drawing and the actual process of the formation of a new object.
To ensure that the geometric object that we are about to draw, namely a square, is of sufficient dimensions for easy viewing, use a sizeable number of steps from the **Motion** folder e.g. 100 steps.

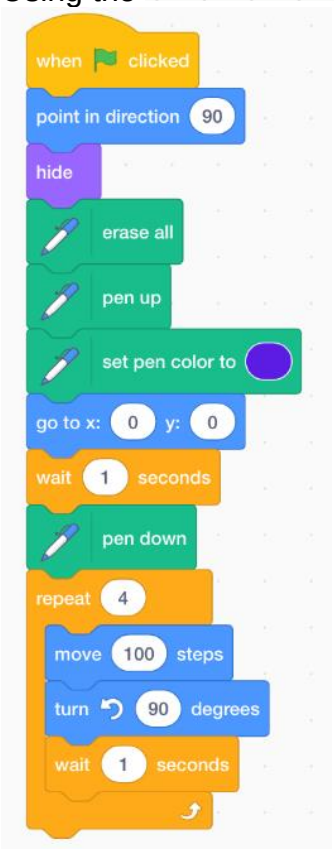
To code in the command that will make the four lines form a box, we first use the Repeat command. In the construction of a square it is **Repeat 4** times.

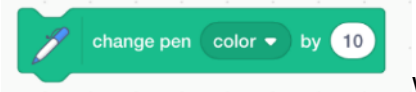
Please note also that for each geometric shape, the angle is proportionate to the number of sides i.e. 360 degrees divided by the number of sides.
For instance, a square is 360 divided by four = 90;
A triangle is 360 divided by three = 120 and
A circle is 360 degrees divided by 360 = 1

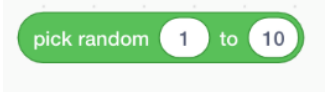
We turn the direction of the lines using the *turn* ____ *degree* block from the Motion category.

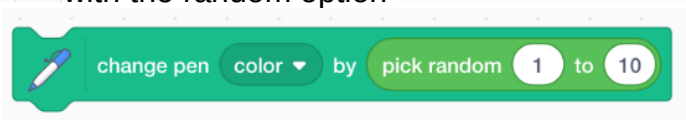
Using the 

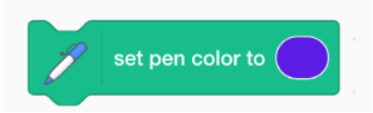
will stop the square being lopsided.



We can also change the colours for each drawing by combining 

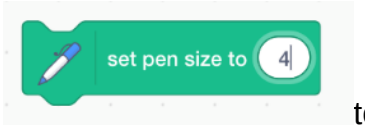
with the random option 

in the Operators category to give 

which can replace 

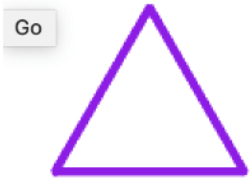
in the script

The spectrum of colours goes from 1 to 200. Hence choosing a high random range e.g. 1-200 (see script below) for colour variation will allow the programme to randomly select from the full range of colours each time that it is run.

Use 

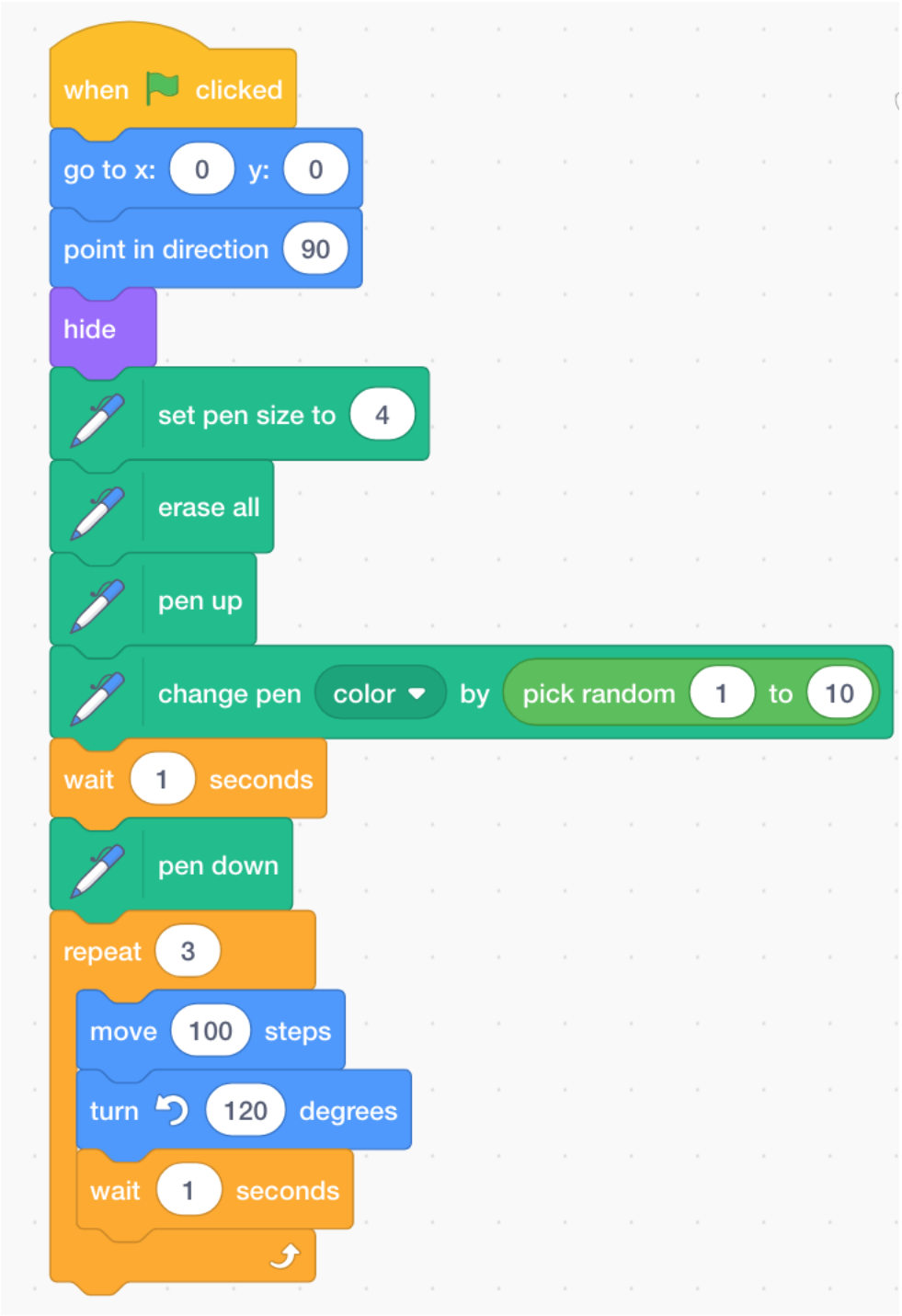
to set a Pen size of your choice

Let's draw a **triangle**



How many sides in a triangle?

What would the angle (degree) settings be?



Let's draw a **circle**.

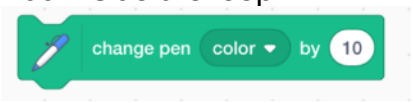
How many turns (degrees) in a circle?

So, turn one degree at a time. Do not use the 

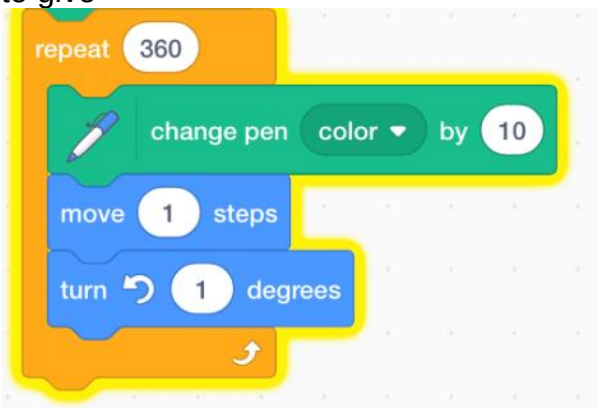
block in the script.

This is because using it will mean that it will take 360 seconds for the circle to complete.

Add inside the loop:



to give



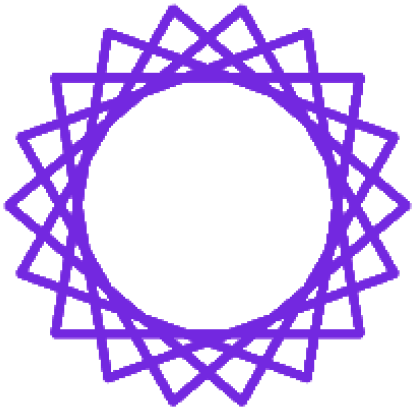
and enjoy the colourful effect.

Exercise

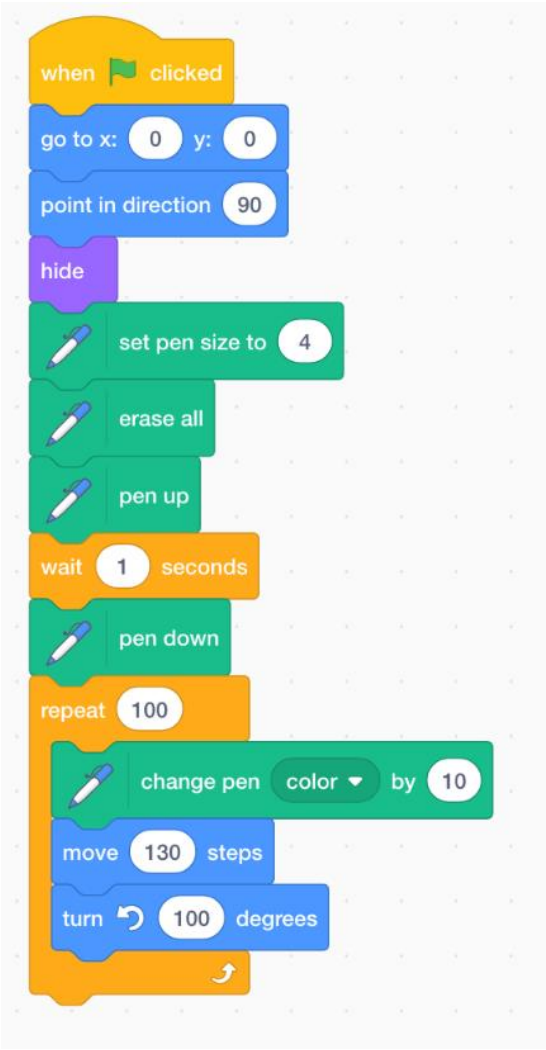
1. Draw a Pentagon
2. Write a programme that draws three different shapes that appear at different times at different locations on the Stage.

Other Shapes

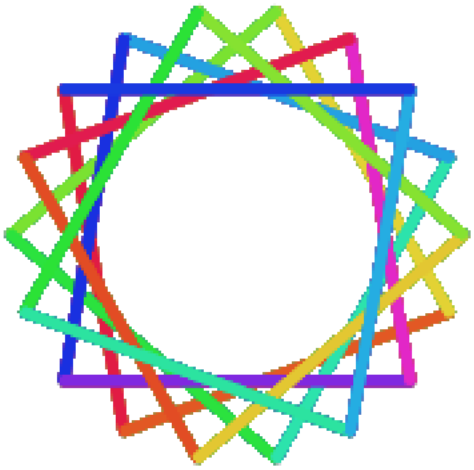
Experiment with different angles and 'repeats' in the programme.
For instance, select the code below and admire the results



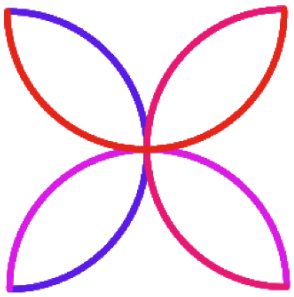
Input the following code:


when clicked
go to x: 0 y: 0
point in direction 90
hide
set pen size to 4
erase all
pen up
wait 1 seconds
pen down
repeat 100
change pen color by 10
move 130 steps
turn 100 degrees

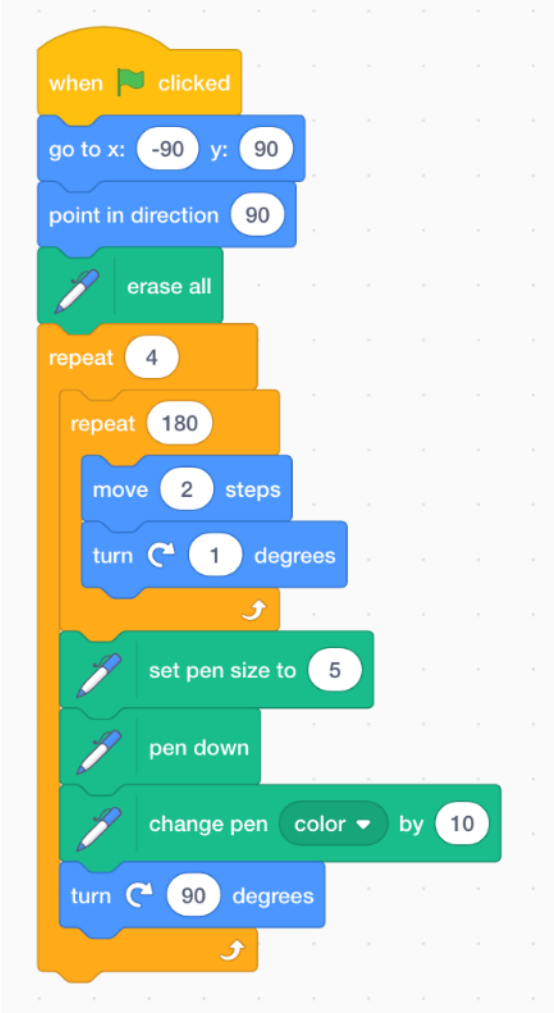
to give



Create a four-petal flower



The effect is achieved by making four half circles (180 degrees) and turning right (90 degrees) at the completion of each one.



By the Way...

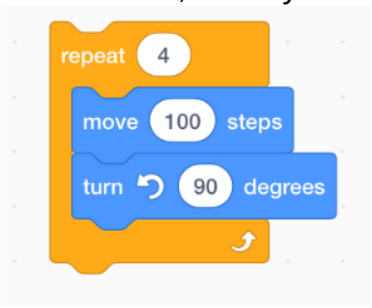
The completed project is located on the ACW Mentors Scratch account at https://scratch.mit.edu/projects/411572612/

Project 4 - Pick and Choose you own Polygon Shape

In this project, participants will be able to create an interactive programme that will allow users to ask the computer to draw different types of polygons by telling it how many sides it has.

In the previous project we learnt how one can write scripts to draw different shapes.

For instance, the key blocks to create a square are:

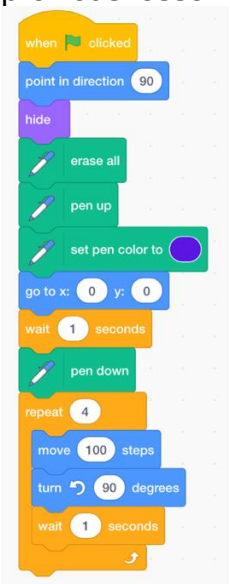


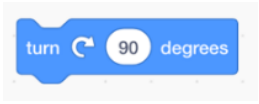
based on

that for each geometric shape, the angle is proportionate to the number of sides namely 360 degrees divided by the number of sides.
For instance, a square is 360 divided by four = 90
A triangle is 360 divided by three = 120 and
A circle is 360 degrees divided by 360 = 1

So let's write an interactive script that will allow the user to answer a question asked by the computer on how many sides he/she would like in their polygon.

For the same reasons as heretofore, we use the same script as we used in the previous lesson to draw a square.



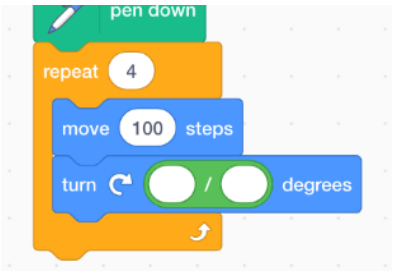
However we will replace the 

block with an arithmetic action of 360 (degrees) divided by 4, which represents the number of sides of a square.

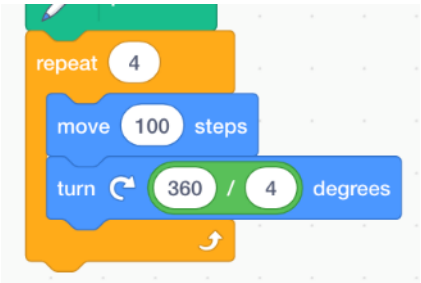
So go to **Operations**.

Select 

And insert it into the script as follows:



Place the number 360 into the first oval shaped white space and the number 4 into the second white spacing.
These numbers are chosen because 360 divided by 4 gives an answer of 90 (see grey block above).



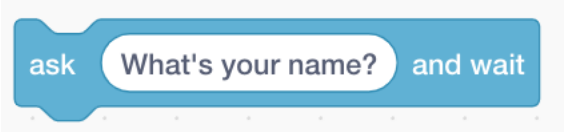
Click on the Green Flag. The result should be a *square* appearing on the stage.

Now we are going to transform the project into one of human interaction by coding in the capability for the script to ask the user to choose the amount of sides that the polygon should have.

First change the Y coordinate in the Motion block from 0 to 100 (to provide better positioning for the range of different shapes that will be created).

Go to **Sensing**

Select



Change the text of *What's your name?* to *How many sides do you want in your polygon?* Select a number between two and eight.

Return to Sensing

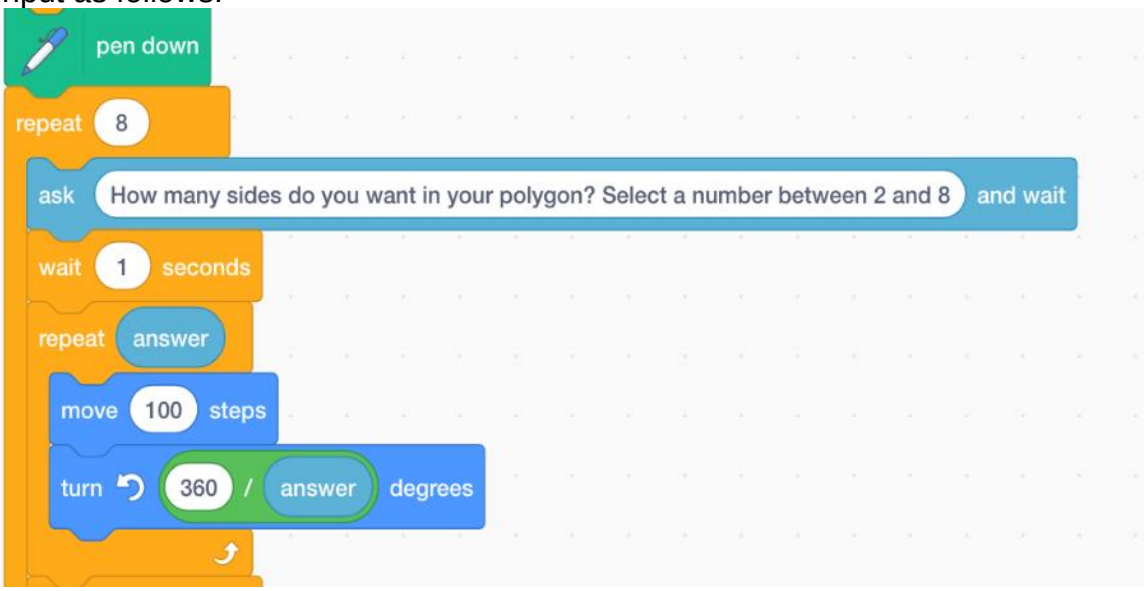
Select 

and place this block into the two oval shaped white spacings occupied by the number 4.

Press the Green Flag.

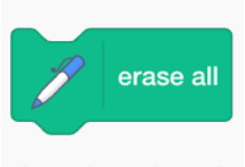
The addition of a Repeat block would improve the performance of the programme as it would increase the level of engagement between the user and the script.

Input as follows:

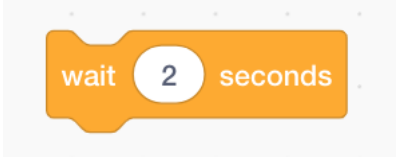


However a problem now arises with the new polygons appearing on top of the older selections.

So input two extra pieces of code:

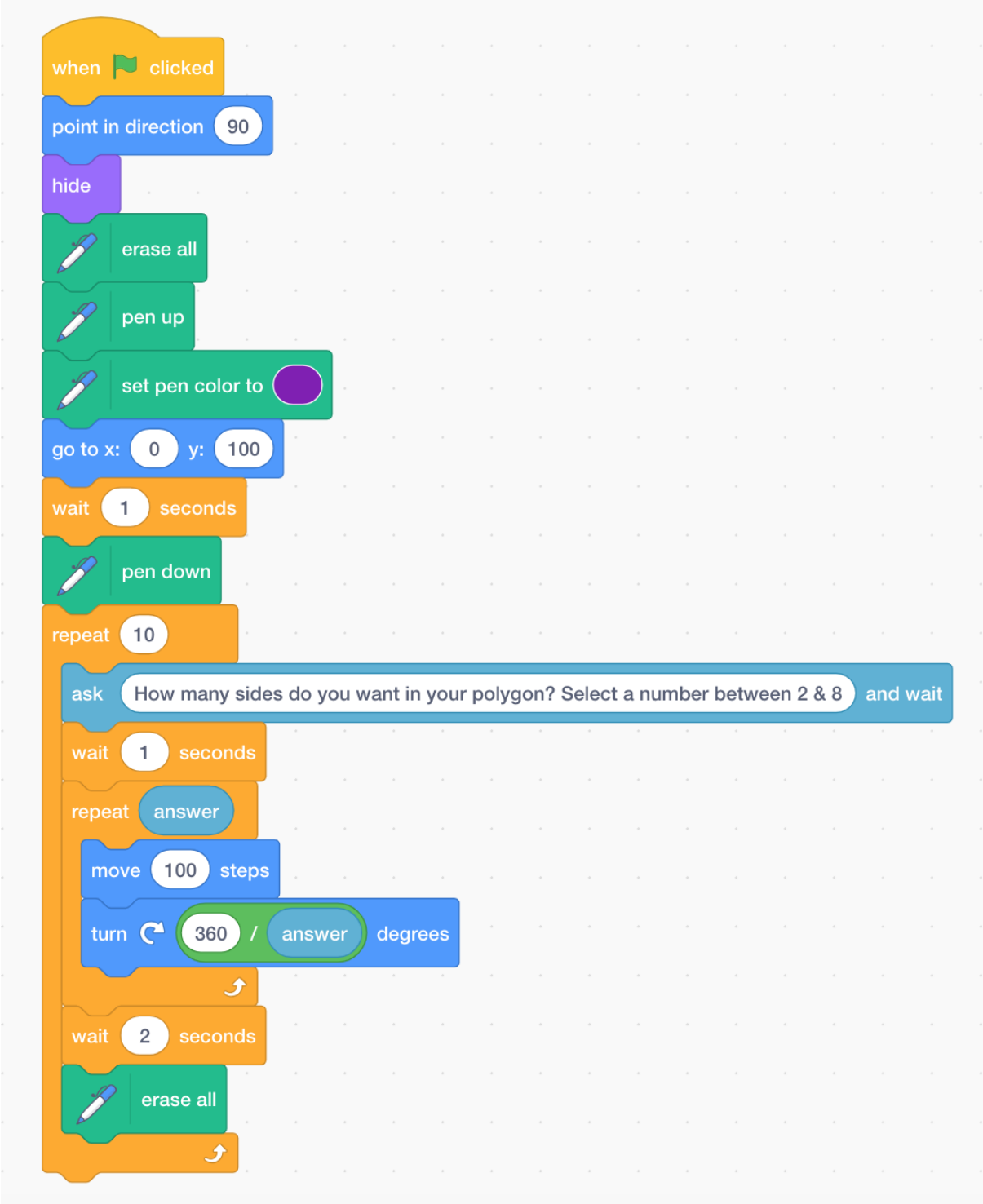


to delete previous drawings

and 

to allow the polygon to remain on screen a few seconds before it is replaced.

The final script should be



By the Way...

The completed project is located on the ACW Mentors Scratch account at https://scratch.mit.edu/projects/411572712/

Project 5 – Why Trees are important

In this project, participants will be introduced to the science of trees, the importance of this type of plant in regulating the atmosphere, in supporting biodiversity, in managing water and in sustaining life on planet Earth.

The project will help children come to a basic understanding of the interconnections between some of the great problems impacting on the natural world, namely Climate Change, deforestation, biodiversity loss and soil degradation.

The medium used is a story with a narrator. But it is important to have elements of interaction included in the Scratch project in order to have some level of hands-on engagement with the young students. Furthermore, consider including a creative arts dimension by getting the participants to draw a tree and/or an animal sprite.

As a follow up to this project, the teacher can use a similar template (story) and theme to undertake a Scratch project on for instance Why Water is important, or Why Rivers are important, or Why Oceans are important, or Why Soils are important.

It could also form part of a wider school, local community or state environmental programme such as a tree planting initiative.

Before the project commences, get the children, under your guidance, to carry out background research and collect information related to the importance of trees in people's lives and that of the planet. This can be preceded by a 'question and answer' session on the topic of the 'Why Trees are important' to gauge or prompt their level of understanding of this key topic. Include if you wish some aspects of local, national, or regional mythological, religious, cultural stories and beliefs associated with trees such as the Baobab.

The material collected can form the basis for planning out the project's storyline.

This project will be based on good scientific knowledge of the role of trees in human society and its wider role as a key part of the planetary biosphere. It is a guideline only. So please use as much or as less of its content as you feel is appropriate to your classroom.

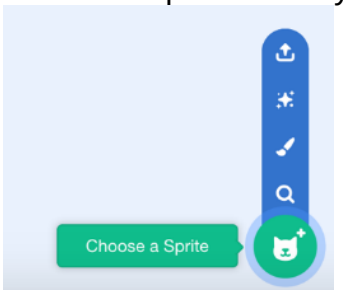
However whatever approach that you take, there is no doubt that this project will last for two, three or more sessions.

To start

First upload Scratch

Delete the cat sprite.

Go to the Sprites Library  in



Select an appropriate sprite from the *People* folder who will function as the narrator such as

Position the Sprite towards the bottom left of the stage.

If the sprite is facing the wrong direction (away from the rest of the screen), then go to *Costumes* and select *Flip Horizontal*.

The next step involves developing a story line of the subject matter, based on short simple-to-understand scientific facts on trees. This can be done in association with the children or prepared in advance by you to be delivered as part of the science curriculum.

For this project we have looked on the role of trees in producing oxygen, food, biodiversity, medicines, filtering out toxic gases from the atmosphere, Climate Change, flooding and soil protection.

Time should be given to choose suitable backgrounds and the sprites for the project.

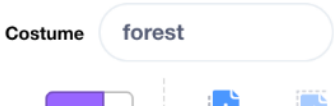
The Backgrounds (backdrops)

Select from the library a background that is a natural area of landscape devoid or trees or river.
Should a suitable type not exist in your estimation in the library, draw a background or alternatively download an appropriate copyright-free online image (example below).

Give it a suitable name e.g. Grassland

Duplicate it.

Give the new background a name (e.g. Forest).
Use the appropriate tools to draw and colour in a simple blue river in the foreground.

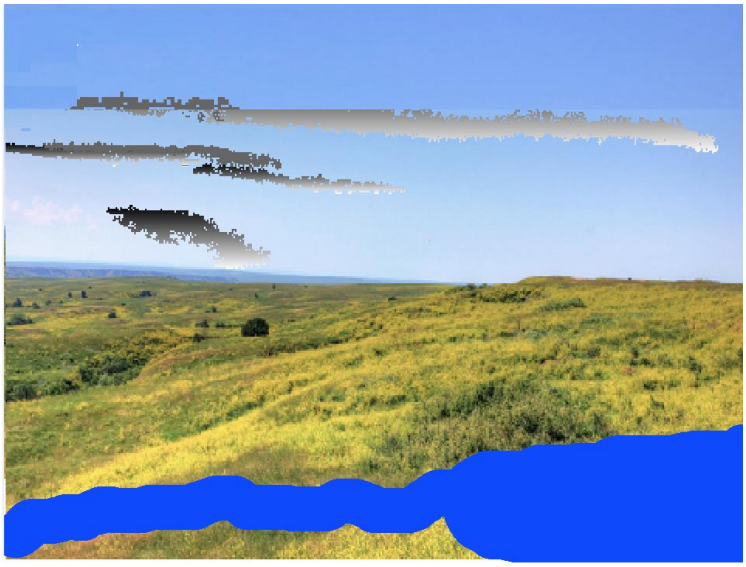


Type in an appropriate name such as Forest in the section

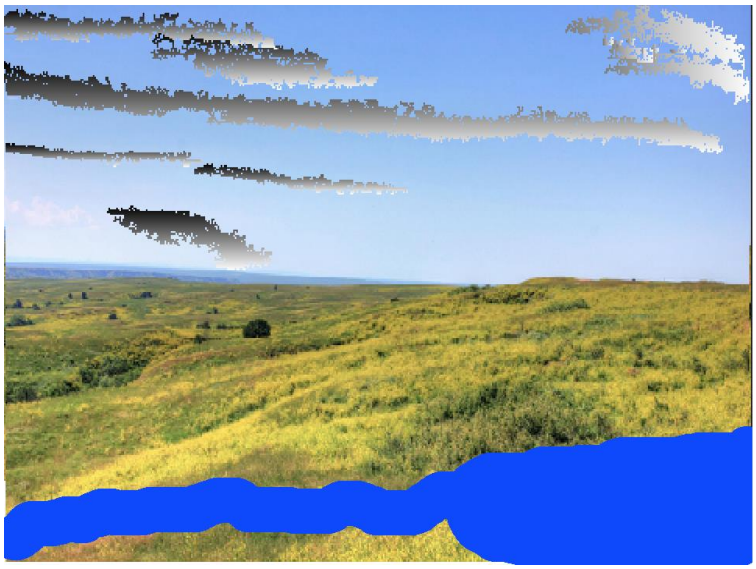
Copy the second backdrop (Forest) four more times.

In one of these new backdrops (Forest4) draw in a light sprinkling of dark clouds. In another backdrop (Forest5) draw in some additional thicker clouds.
These two costumes will represent different levels of atmospheric pollution.

Forest4



Forest5



Scene 1: The Introduction

The Opening Background

Go to Backdrop1 (white) which will be the first background that will be used in the project.

Select **T** for text in the Tool menu.

Select the colour Black in the palette 

by bringing the three sliders to the far left.

Use the Text tool  to type in *Why are Trees important?* and drag the text to the top left side of the screen in the Costumes work area.

The Sprites

Draw a series of sprites and/or use sprites from the Scratch library.

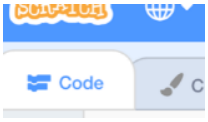
In this Scratch demonstration, we will use sprites representing:

- Interactive Box Label
- Trees
- Fruits (3)
- Insects (2)
- Monkeys (2)
- Fish
- Bird
- Frog
- Woman
- Boy
- Buildings (2)
- Vehicle
- Sun

Try to provide enough time in the first session to allow the children to draw at least one sprite (e.g. tree) so that they can feel personally connected artistically to the project.

The ‘Tree of Introduction’

Position the tree sprite towards the centre of the stage.

Go to 

code icon.

Go to **Events** category and select the block 

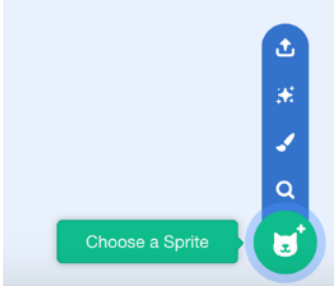
Drag and drop into the **Scripts area** (also known as **Workspace**).

Go to **Looks** and connect show to the previous block.

Then place an X and Y block from **Motion** onto the script

The Interactive Box Sprite

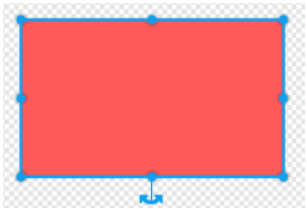
To bring in an interactive element to the project, use the paint brush icon in



to draw a new sprite

Select a Red shading in the palette

Then click on the rectangle icon  in the tool kit to draw a red box



Select the colour white from the palette, click on the Text Tool  and type in the text Click here to find out.

Position the sprite on the bottom right side of the stage.

Now we start to build its script

Go to Events category and select the block 

Drag and drop into the Scripts area (also known as Workspace).

Go to **Motion** category.

Drag and drop the X and Y block into the workspace and connect to the proceeding block.

The X and Y coordinates of the sprite should automatically be picked up by Scratch and appear in the two white boxes of 

Go to **Looks**, chose 

and place it between the two existing blocks in the script.

The Tree of Introduction Sprite

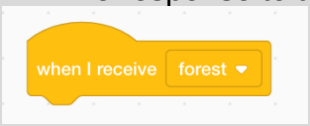
We want the tree sprite to disappear when the programme moves onto the next background in response to the user clicking on the 

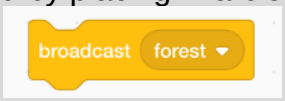
sprite.

This is achieved by the getting it to hide once it responds to a broadcast message telling it to do so.

Broadcasting

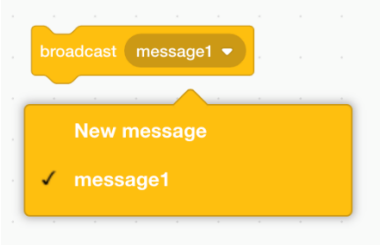
Broadcast is used in Scratch coding to send a message (a communication or broadcast) from one element such as a sprite to some other part(s) of the programme, which could be another individual sprite, multiple sprites, backdrops or even another script in its own workspace, instructing it or them to implement an action.

The response to the message from the recipient sprite 

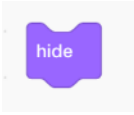
is initiated by placing in a block of code in the sender's script 

The broadcast blocks, located in Events, will be used extensively in this project.

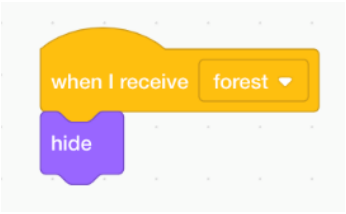
To create a new broadcast message, first go to the broadcast block and click on message1 to select *New Message*



Type in *forest*

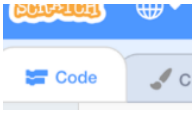
Place the block in the workspace and connect it to 

from Looks



The Interactive Box Sprite

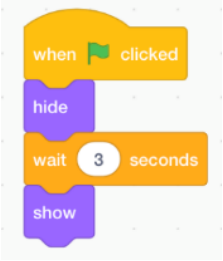
To activate the change in the backgrounds, that is from *backdrop1* to *forest*, go to the



section of the 

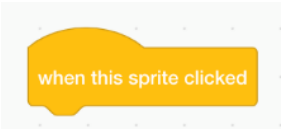
sprite.

To have it appear a few seconds after the Green Flag is clicked by the user, input the following script

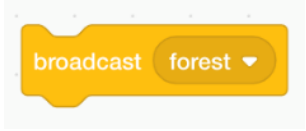


The opening screen should look as follows

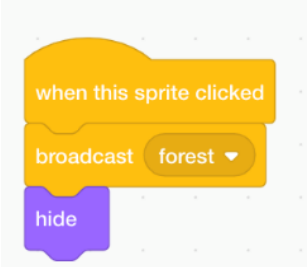
To start the process of having this opening screen disappear and the next screen (forest) appear when the sprite is clicked, we use from **Events** the



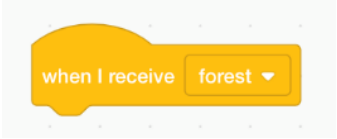
block and the



broadcast command in combination with *hide*



This script will send out (broadcast) messages to a number of appropriate sprites to either hide or to show when they have embedded the

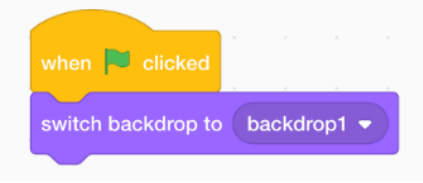


block into their code.

The Backdrops

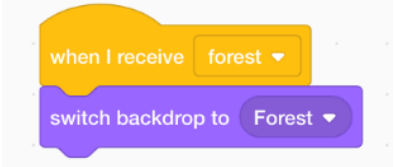
Go to the code section of Backdrops.

To ensure *backdrop1* background always appears when the Green Flag is clicked, input



To ensure that the second (forest) background always appears when

is clicked, input

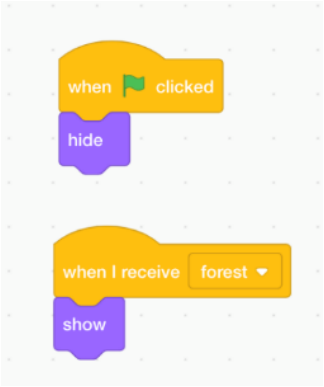


The second background has to be populated with trees.

The Tree Sprites

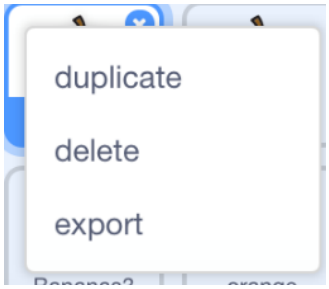
Copy the Tree sprite by right clicking on its small icon and selecting duplicate.

In the second tree sprite, delate the motion block and reverse the *Show* and *Hide* blocks in the code to give



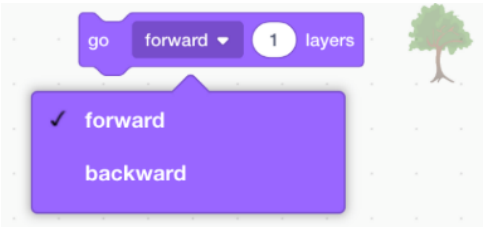
Reduce it in size to ensure that it does not take up too much of the stage area.

Duplicate this tree sprite multiple times and reposition them across the stage.



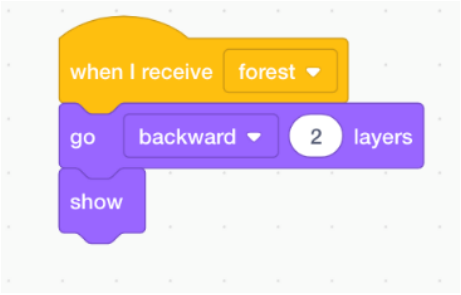
In order to give the impression of depth (layers) we need to have some trees positioned towards the front, others in the middle and still others towards the back of the forested area that we are creating.

So go to Looks and select

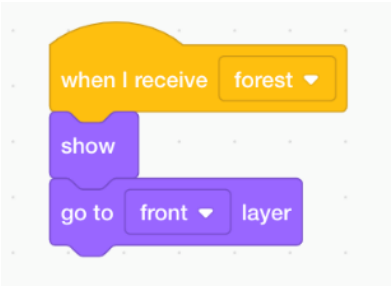


Drop this block into the script of the tree sprites using a mix of settings from their drop-down menus as the following examples show in the script from two different tree sprites

Tree A



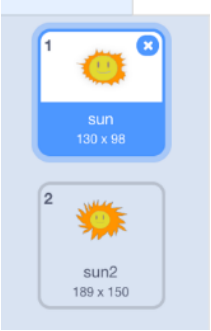
Tree B



The Sun Sprite

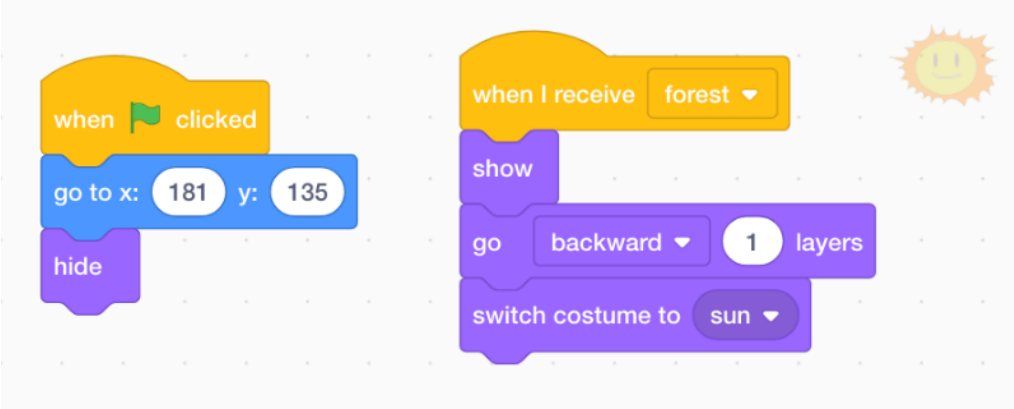
Select a Sun sprite from the Scratch **library**

Make a second costume.
In this version, use the drawing tool and colouring option to increase the proportions of the sun's rays.

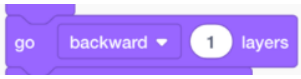


Sun2 costume will be used later in the programme.

Position the sprite in the sky of the forest backdrop using the following script

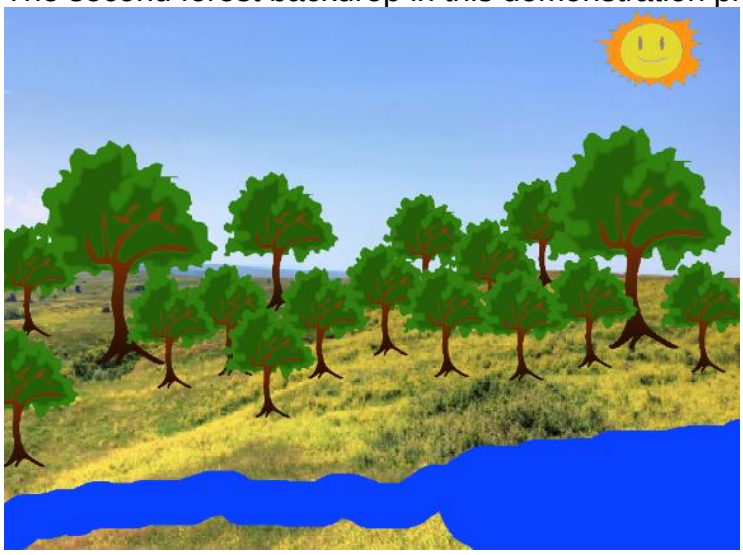


Please note that your X and Y coordinates will no doubt be different from those shown above.

The 

is used as we want the sun to always appear in the background when bird sprites are flying across the sky.

The second forest backdrop in this demonstration project now appears as follows

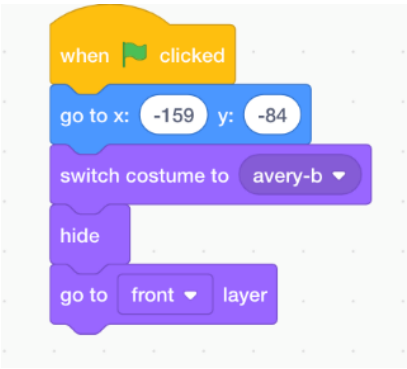


Scene 2: Trees & Oxygen

Stagger the appearances of the sprites.
In the first forest backdrop introduce the narrator, static sprites (trees) and one moving talking sprite. The latter is sufficient as we want to focus of the viewer's attention onto the storyteller.

The Narrator

Input the following script



as the narrator will be hidden in the opening screen and should always be positioned in the foreground (front) with other sprites such as trees, animals and fish appearing behind her.

In the example used, the costume (*avery b*) of the narrator will show her hands in a relaxed non-gesturing pose.

We will now build up a narrative.

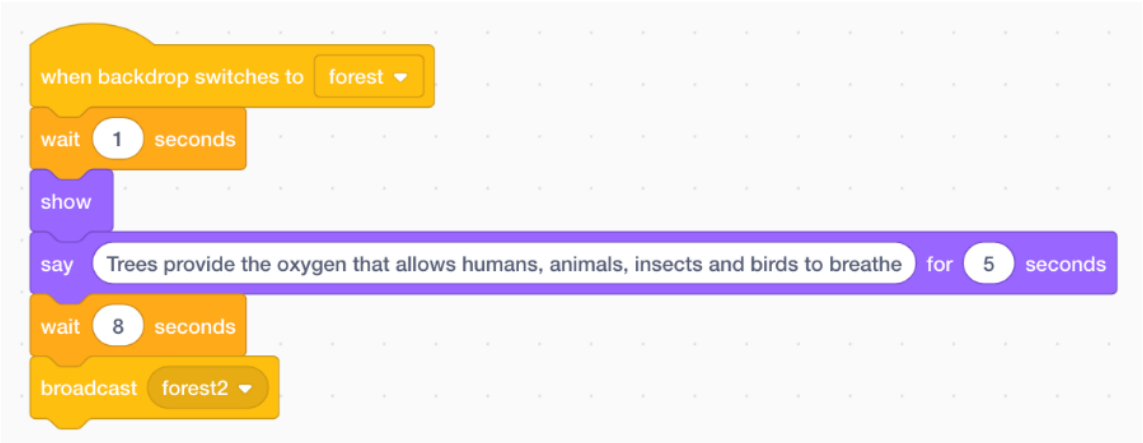
The narrator will be a constant throughout each element of the story providing different pieces of scientific information as the project progress, often accompanied by a changing background and/or other sprite(s).

What is a Tree?

A plant that is generally characterised by having a hard woody stem

In Scene 2 (forest), unhide (show) the narrator and have her briefly refer to the life-giving characteristic of plants.

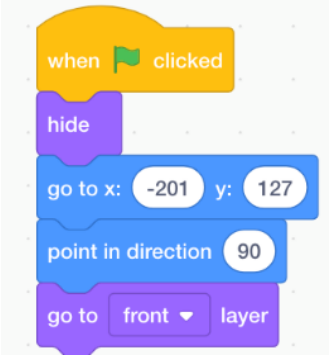
Once her scientific fact is spoken, the script will change the backdrop to go to scene 3 (forest2).



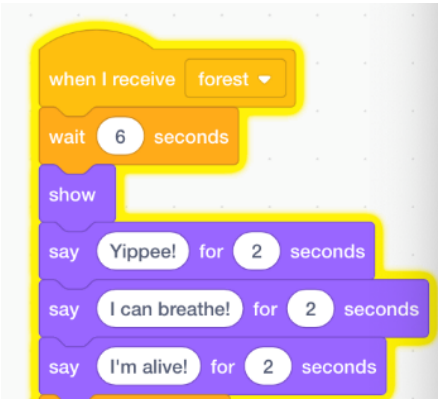
In this case there is no actual visual distinction between the Forest and Forest2 backdrops; they are used only to facilitate a new thematic comment by the narrator and the introduction of sprites by way of the broadcast blocks.

The Bird Sprite

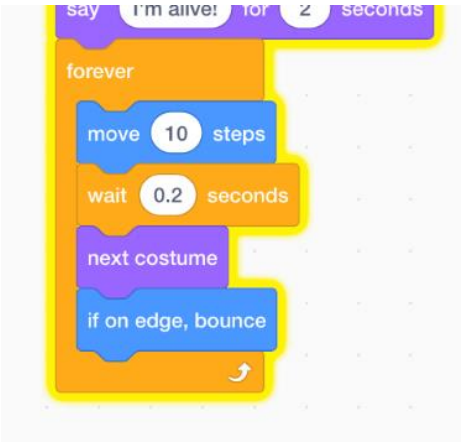
The bird sprite is hidden in Scene 1, is positioned in the sky by using an X and Y motion block, moves only upright by way of a 90 degree angle (moves upright) block and is always at the front of other sprites when it is flying across the screen thanks to the *go to front layer* code



The appearance of the bird in Scene 2 is delayed by a few seconds to allow time for the narrator to finish her speech on how trees provide oxygen to fauna.
The bird should allude to that in its script.

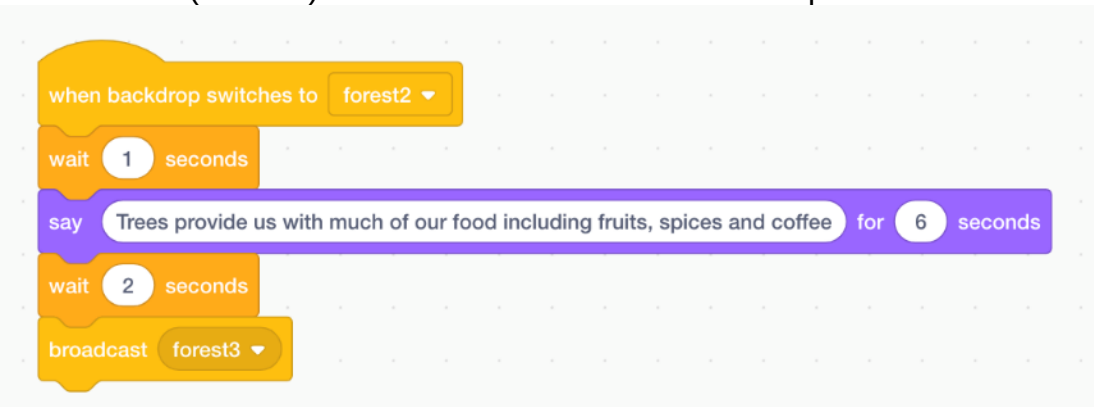


To allow the bird to constantly (*forever*) move back and forth across the screen (*if on edge bounce*) and to animate the movement of its wings (an ongoing change between costumes with different wing settings), attach the blocks of code below to the above script



Scene 3: Trees & Food

In this scene (Forest2) the narrator will talk of the food aspects of trees

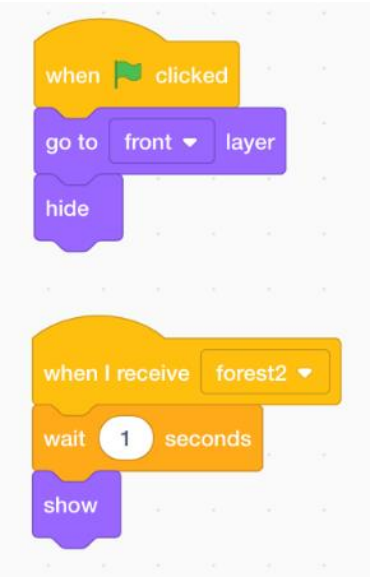


Introduce the fruits that provide food to humans and wildlife.

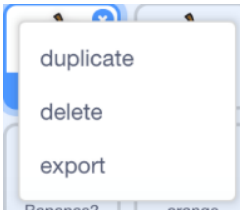
From the Scratch library, select an orange  , a banana  and an apple 

Attach each fruit to a different tree

As all three fruits will first be seen in the Forest2 backdrop and will appear in front of the tree, input the following script in all of these sprites



Duplicate each of the three sprites multiple times and populate their individual tree with additional fruits

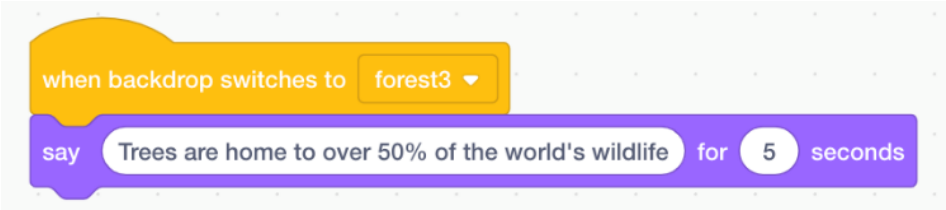


Before duplicating you can, if you wish, use a X and Y motion block for each fruit whose coordinates are correct once the sprites are placed in their final position.

The scene will now show as

Scene 4: Trees & Wildlife

In this scene (Forest3) the narrator will start by briefly mentioning the importance of trees to wildlife



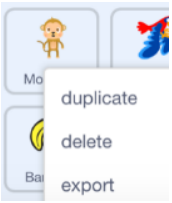
Input a variety of wild fauna sprites from the Scratch library as well as from, if you wish, a free online image gallery.

In this demonstration, two insects, two monkeys, one fish and one frog join the bird and trees that are already in the project.

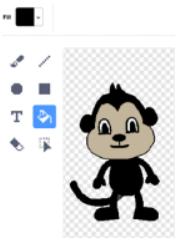
The Monkey Sprites

Choose

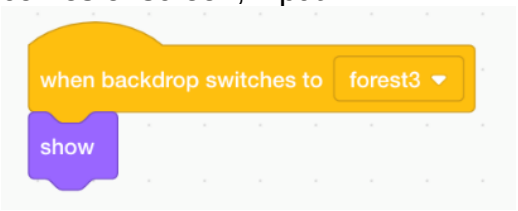
Duplicate this sprite



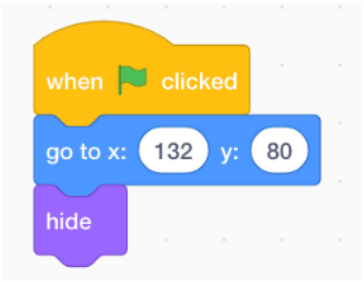
Go to Costumes and use the paint tool and colour options to paint the second monkey in another colour (just to give some variety!).



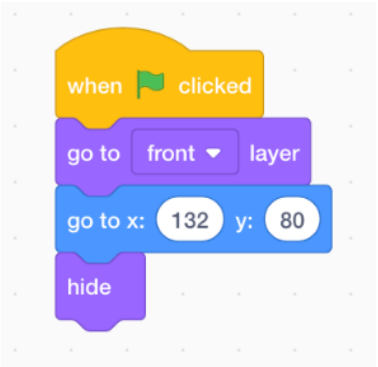
To have these new fauna sprites only appear onscreen when this third (Forest3) comes onscreen, input



However to ensure that they are hidden when the project starts, use the following script with a different X and Y coordinates for each

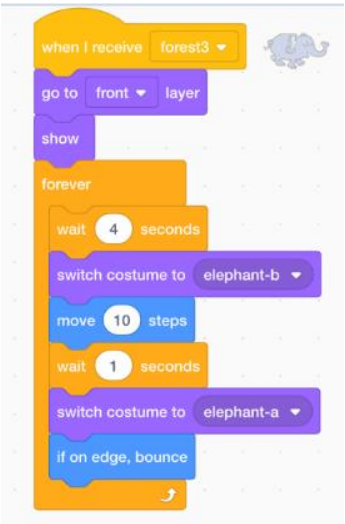


Depending on the specific sprite, a layer positioning block can be used.
For instance, in the case of the monkey sprites, they need to appear in front of the tree rather than behind it.
So the front option in the **go to** _____ **layer** block should be introduced.

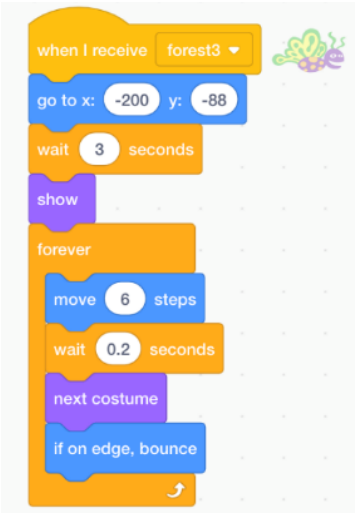


To have the monkeys move (jumping/gliding) from branch to branch, use a combination of the *switch costume to* (Looks category), *glide* (Motion) and *forever* and *wait __ seconds* (Control) blocks

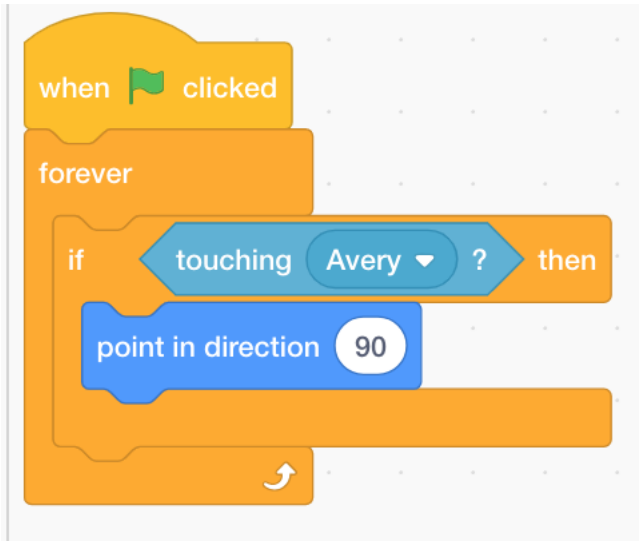
In the other fauna scripts, move ___ steps will be used in some of these sprites instead of the glide___ secs to x: ____ y: ___ block (as with the monkeys) along with if on edge bounce and next costume



or



To ensure that the elephant does not walk in front or behind Avery the narrator (positioned on the left of the stage), input a script that will have it change direction by way of a 90 degree right turn



For variety, special effects and reflecting the interrelationships between different species within an **ecosystem** (see below), code in the two insects to disappear (hide) when they come close to the frog and fish. This represents them being eaten by their natural predators.
Have them reappear (show) a short while later.

Ecosystem

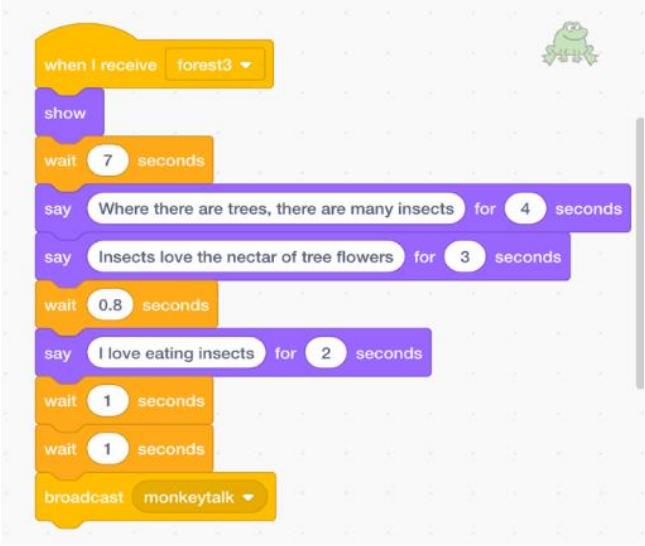
A large community of living organisms (plants, animals and microbes) in a particular area. The living and physical components are linked together through nutrient cycles and energy flows. **Ecosystems** are of any size, but usually they are in particular places.

To give the impression of the stationary frog catching the insect, code in both of its costumes


frog

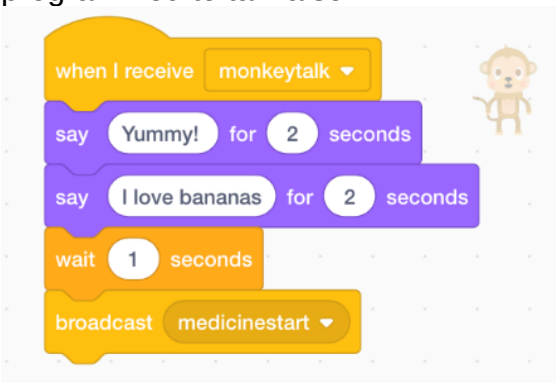

frog2

Let some of the animals give some short informative talks to commence after the introductory piece by the narrator. This can be done by a broadcast command or alternatively using a *wait* ___ *seconds* block.
End the script with a broadcast block to activate another animal to talk.

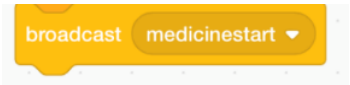


Using the *wait* _____ *seconds*, the flight of an insect can be synchronised with the frog's talking so that it disappears from the screen immediately after the frog says (see script above) *"I love eating insects"*

Thanks to the broadcast command in the script above and below, the monkey is programmed to talk also

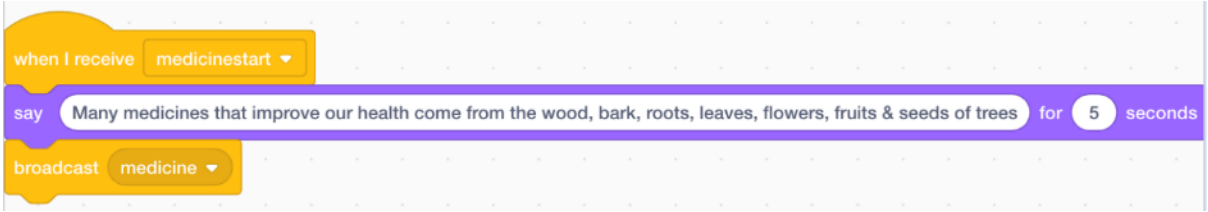


Scene 4a: Trees & Human Health

The 

block in the script of the monkey above is picked up by the complimentary 

in the narrator's script

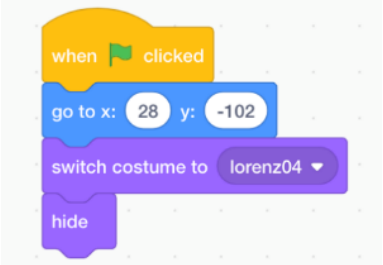


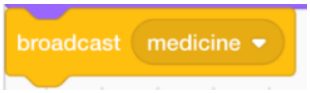
The Sick Boy Sprite

Introduce a sprite, either drawn, downloaded from the copyright-free online gallery or from the Scratch library (e.g. Ten80's 8th costume) which can be represent a young person feeling sick.

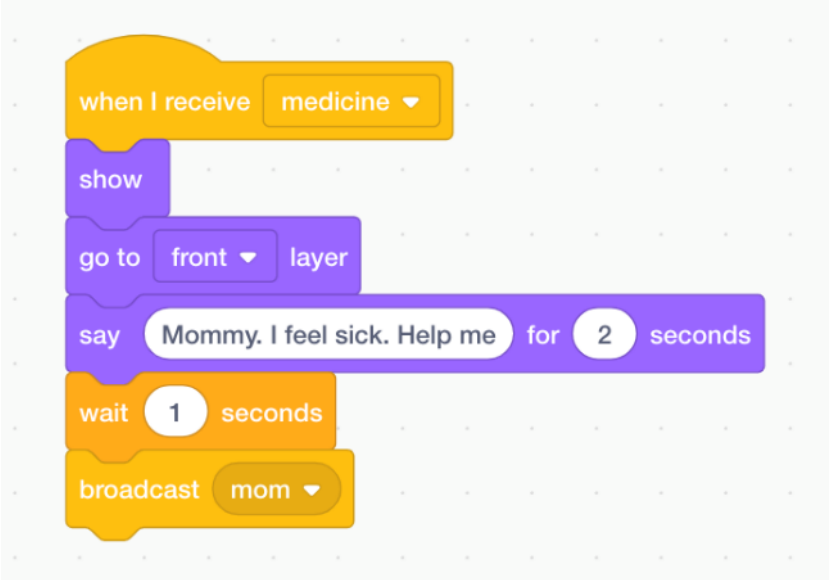
For example

The new sprite will be hidden by its opening script of



until it is activated by the 

block in the previous sprite's (narrator) script in association with its own script of

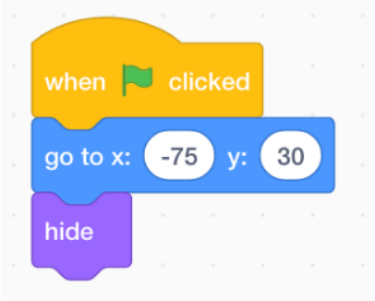


The Mother Sprite

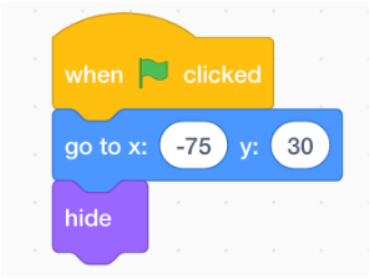
Introduce a woman (singer) sprite from the Library to represent the boy's mother and position her in the front not far from the boy sprite

Singer1

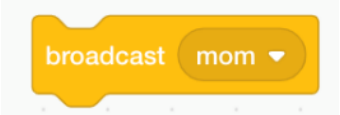
As with so many other sprites, the new sprite will be hidden by its opening script



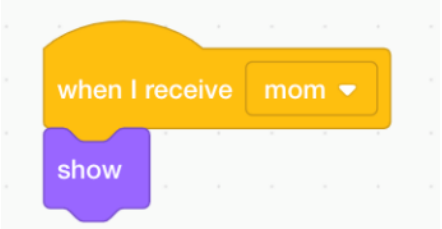
Introduce another sprite that will represent a bowl  containing a herbal medicine mix that should be positioned with a X and Y motion block in front of the mother's sprite.

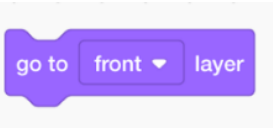


The mother sprite will show onscreen when it is activated by



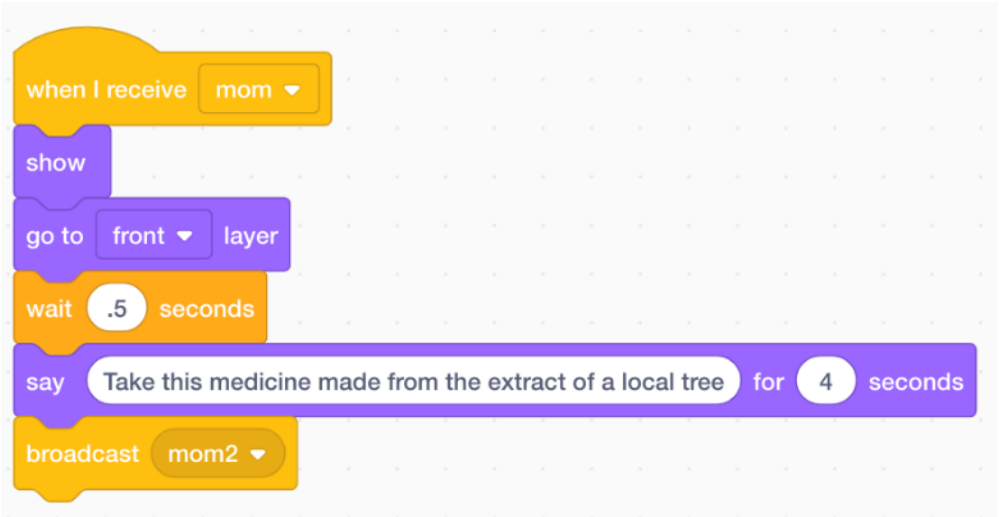
in the boy sprite's script in association with its own new script commencing with





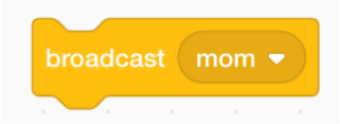
However it needs the addition of a block so that it appears in front of the flora and fauna sprites that are already on the stage (screen).

Input a Say____ for ____ seconds block with a relevant comment preceded by a short *wait___ seconds* block and followed by a new broadcast (mom2) that will help activate a script in another sprite.

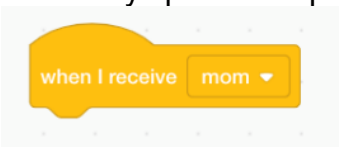


The Medicine Bowl

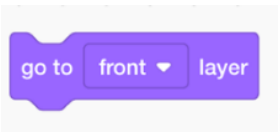
The medicine bowl sprite will show onscreen when it also is activated by



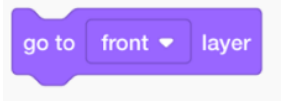
in the boy sprite's script in association with its own new script commencing with



However it needs the inclusion of a *wait* ____ *seconds* block before

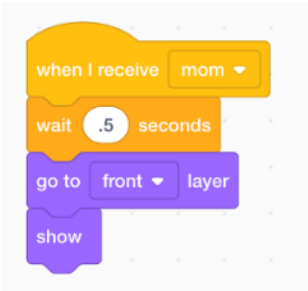


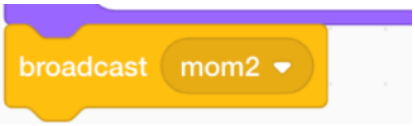
is added to the script. Only then will the show block be used. This is because this medicine bowl sprite should appear in front of the mother sprite which also has to appear in front of the flora and fauna spites already onscreen. The last sprite to use the



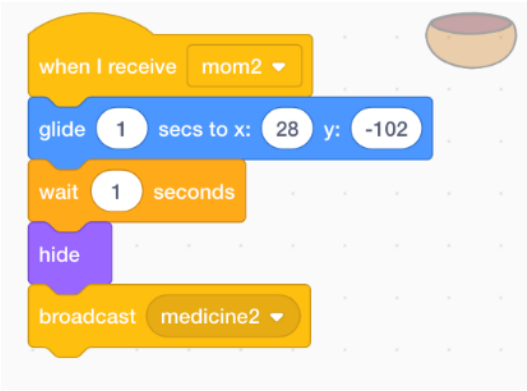
block will be the one that appears in front of all other sprites.

Hence the code for the medicine bowl should be as follows



In response to the mother sprite's 

block the bowl will use the glide block from the Motion category to move towards the boy sprite.
After a short delay (wait___ seconds) the bowl's script will activate the boy sprite to respond (new broadcast block) to the medicine he takes and then instruct him to disappear (hide) from the screen



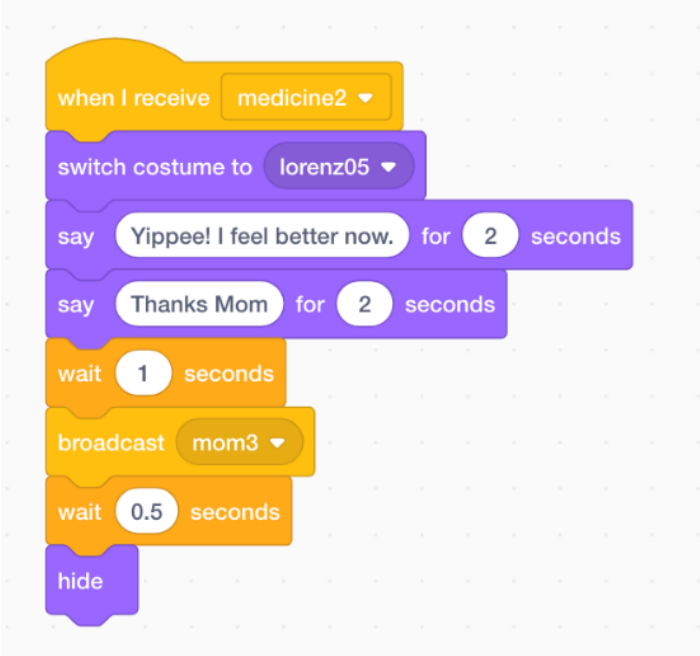
The 

will be responded to by 

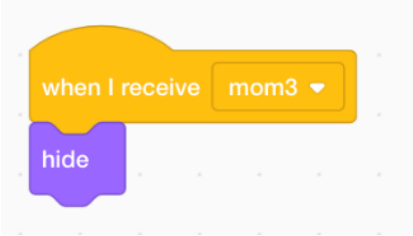
that will commence a new script in the boy sprite.

Select a costume for the boy sprite that will personify happiness or contentment

Complete a script that will change costume and say words of joy and thanks(Looks category), as well as provide a broadcast (Control category) to be sent to the mother sprite to hide



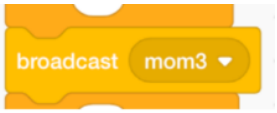
The mother sprite will need one more short script to complete this present part of the storyline.



Scene 5: Trees, Air Pollution & Urban Heat

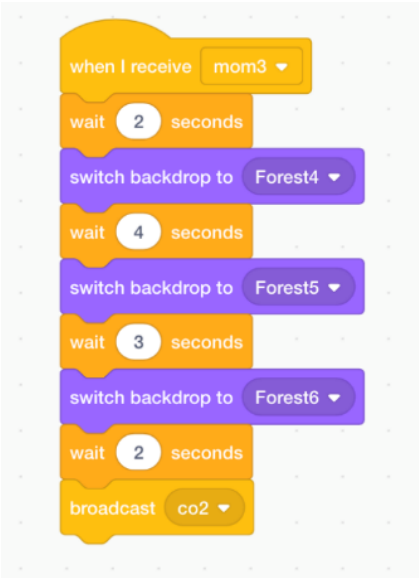
The Backdrops

Within one backdrop (forest4) there is the presence of a few dark clouds in the sky. In forest5, there are additional thicker clouds.

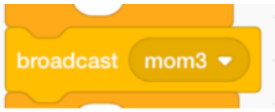
These two Backdrops represent different levels of atmospheric pollution and are activated in response to the 

block in the boy sprite's script.

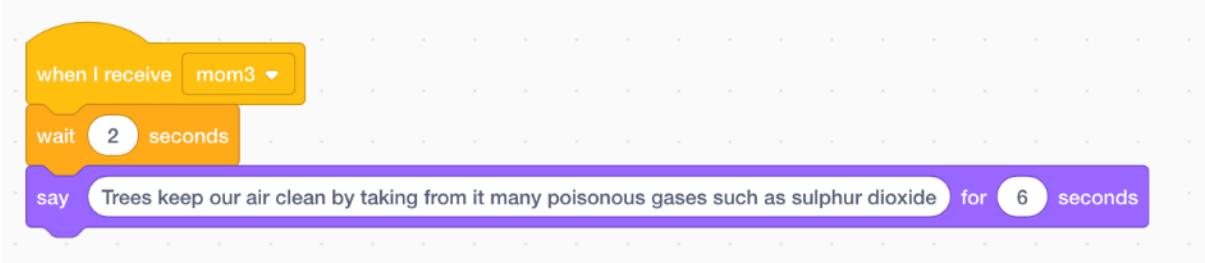
Go to the Code element and input the following

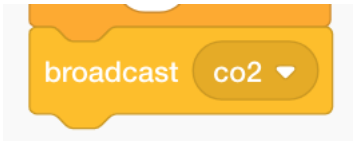


The Narrator

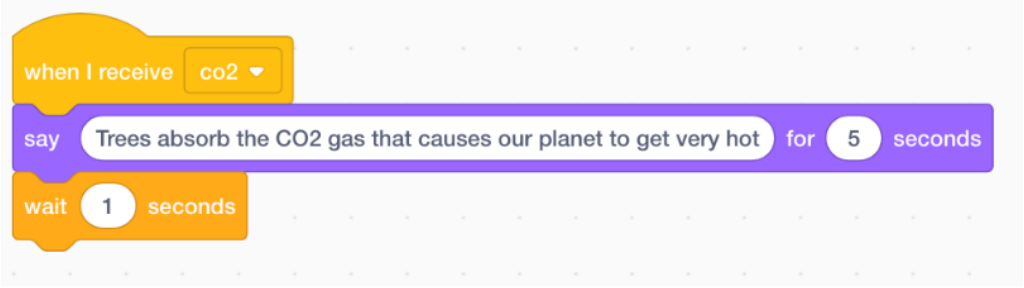
In response to the 

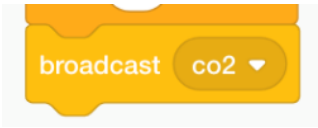
block in the boy sprite's last script, input the following script



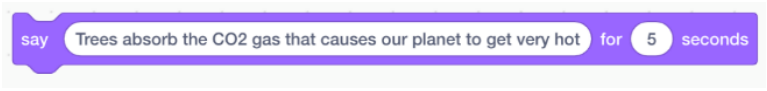
In response to the 

block in the Backdrop's last script, input the following script

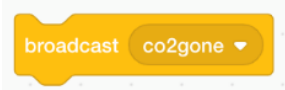


The 

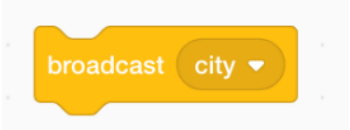
also activates the Sun sprite to enlarge in order to give the impression of increased global warming.

With the positive message of 

a broadcast block now is included in the script to get the Sun sprite to return to its normal smaller size.

This is done by the addition of a new message 

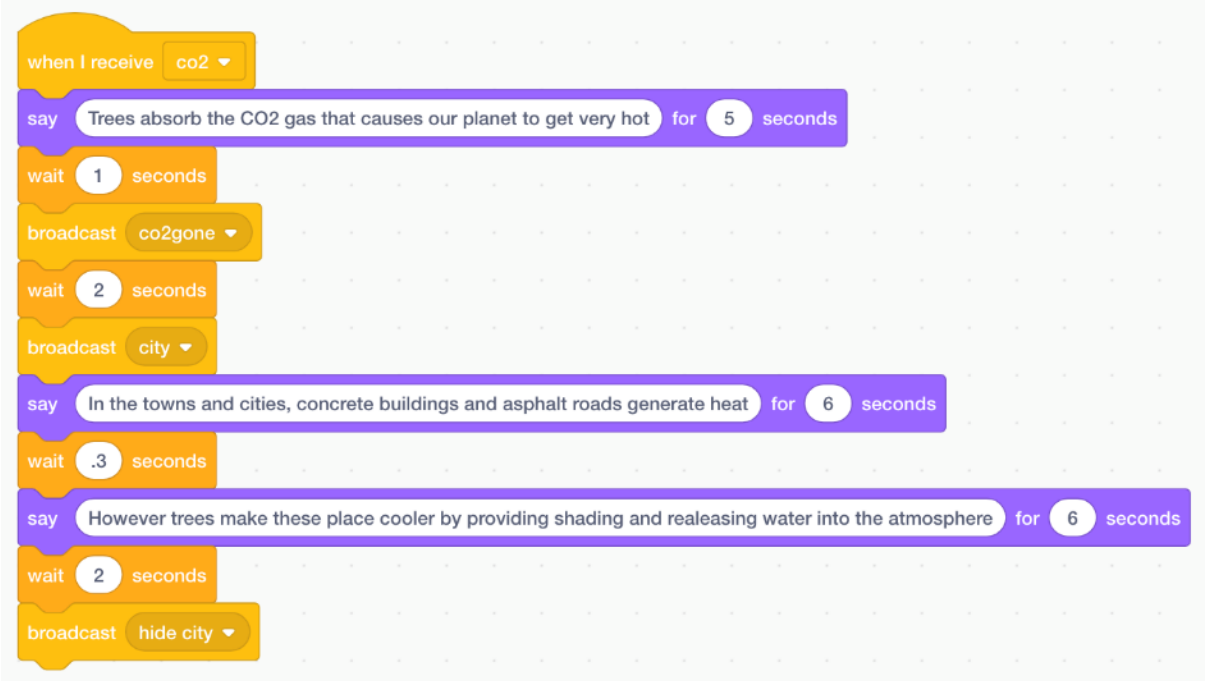
which is received by the Sun sprite (see next section).

Go to Controls and make a new broadcast message entitled 

which should then be attached to the previous script.

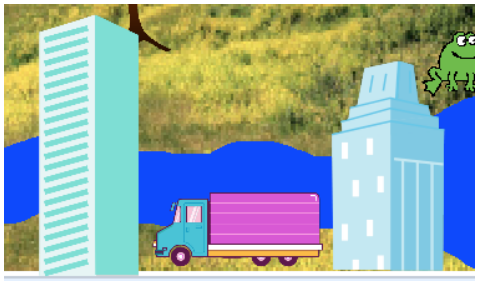
Go to Looks and select two of the Say_____ for __ seconds blocks. Increase the duration (amount of seconds) of both.

Connect these blocks to the current script with the two *Say* ____ blocks interspaced by *wait* ___ *seconds* blocks as below

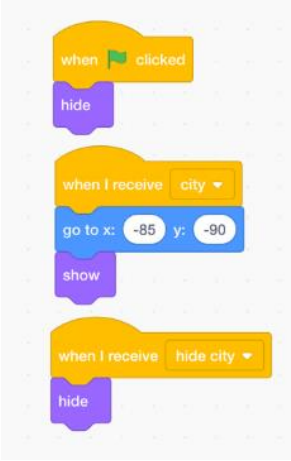


The project now needs the addition of a number sprites to represent life in a city. These can be found in the Sprite library.

In this project, two building sprites and one truck sprite are used



All these sprites will have the following three scripts (with differences of course for their X and Y coordinates).

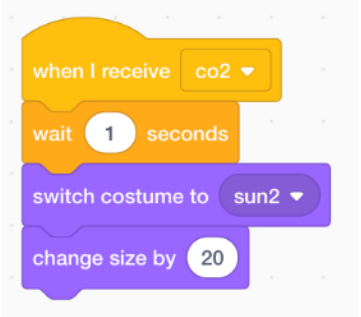


The Sun

As mentioned in the Narrator's section above, the

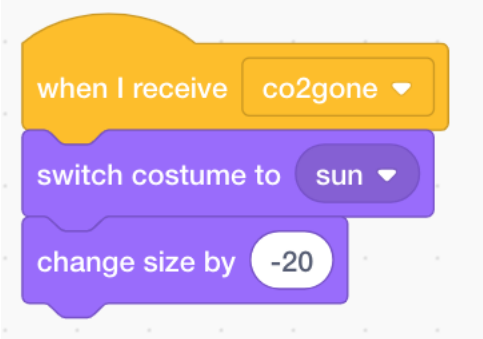
block activates the Sun sprite to enlarge in order to give the impression of increased global warming.

This is done by making a script comprising *When I receive*_____broadcast (Events), a **switch costume to Sun2** (Looks) and a further block to increase the size of the sprite (Looks)



In order to return to normal size as a response to the

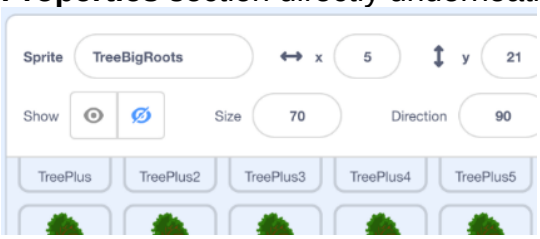
block in the Narrator's broadcast, the following script will be inputted



Scene 5a: Trees, Flooding & Soil Retention

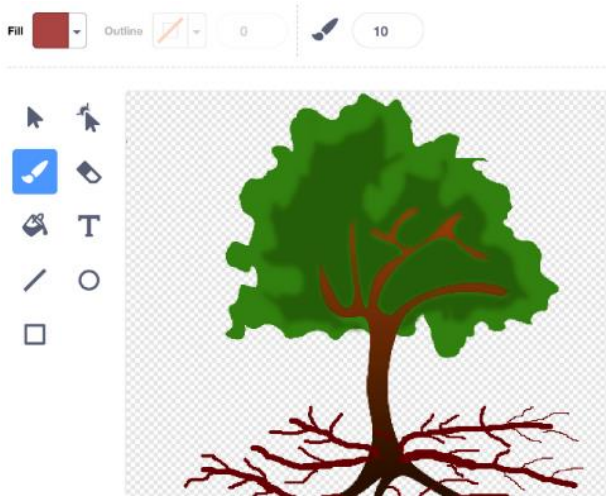
Duplicate one of the tree sprites

Increase its smaller than normal size from what is probably 20 (this reduction was undertaken earlier on in the project) to 70 which can be undertaken in the sprite's **Properties** section directly underneath the stage.



Go to the Costumes section of this sprite.

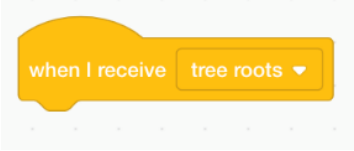
Using the Fill option (colour) and the paint brush, draw in extended roots



Position the tree in an appropriate position on the landscape amongst the other smaller trees.

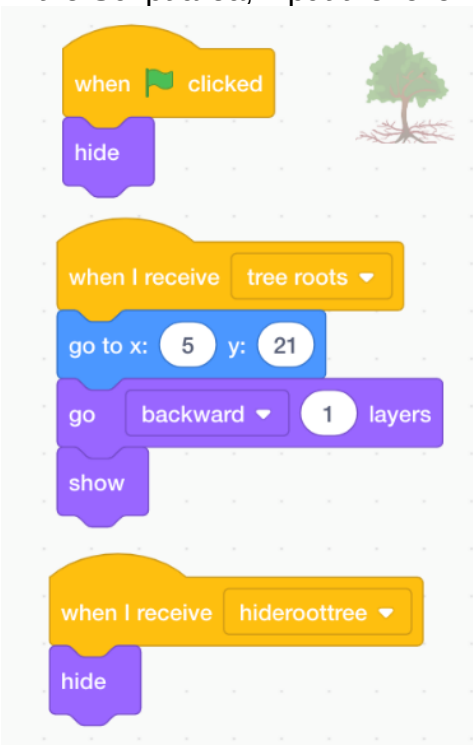
Go to Events category.

Create two new messages in the broadcast block, firstly *tree roots* (or similar name)

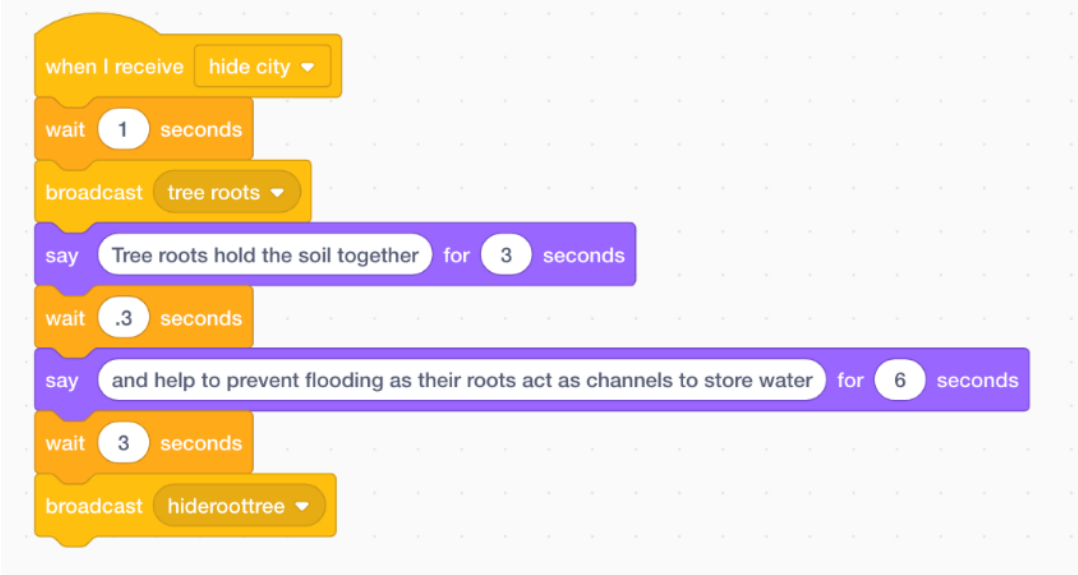


and secondly *hideroottree* (or similar name)

In the Script area, input the following three scripts



The two *when I receive* _____ blocks are in response to two corresponding broadcast commands in a new script to be inserted in the Narrator's code, namely



Scene 6: A World without Trees

At this stage of the project the participants have built up a great story on the positive contributions of trees to the planet.

It is time now to complete the narration by looking at what would happen to the climate, biodiversity and humans if all the trees were cut down.

As well as the human narrator, different fauna sprites will tell us one after the other of how the disappearance of trees will impact on their lives and that of the planet.

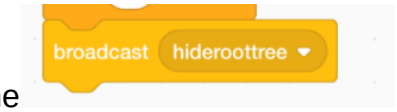
The connections between the different narrators and the consequences of what they say will be activated in the programme by the use of the broadcast blocks from the Events folder.

The viewer will also be involved by having to interact with the programme in order for the project to continue.

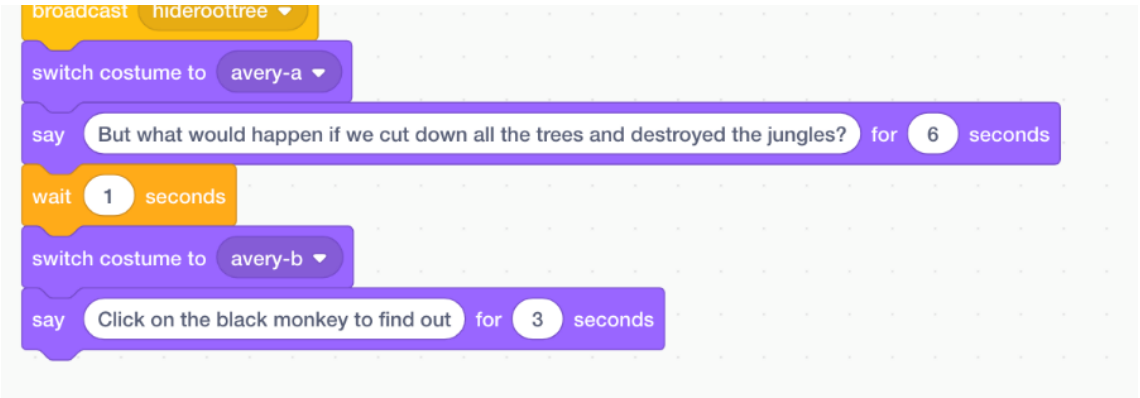
The Narrator

Return to the Narrator's Workspace.

Change the costume of the sprite to give the impression of the narrator engaging with the viewers.

Attach onto the last script which ended with the 

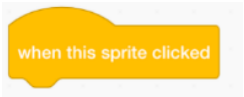
block, the following



The Black Monkey

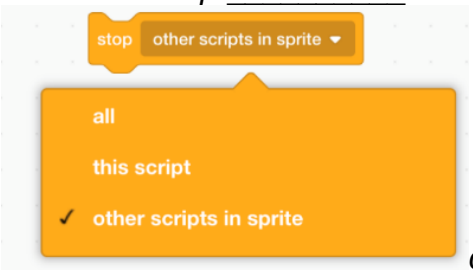
As the above narrator's script makes clear the user must click on the black monkey sprite for the programme to continue

Click on the black monkey icon

From Events, drag and drop into the workspace 

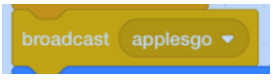
Go to Control

Select the *Stop* _____ block, connect it to the previous block and choose the



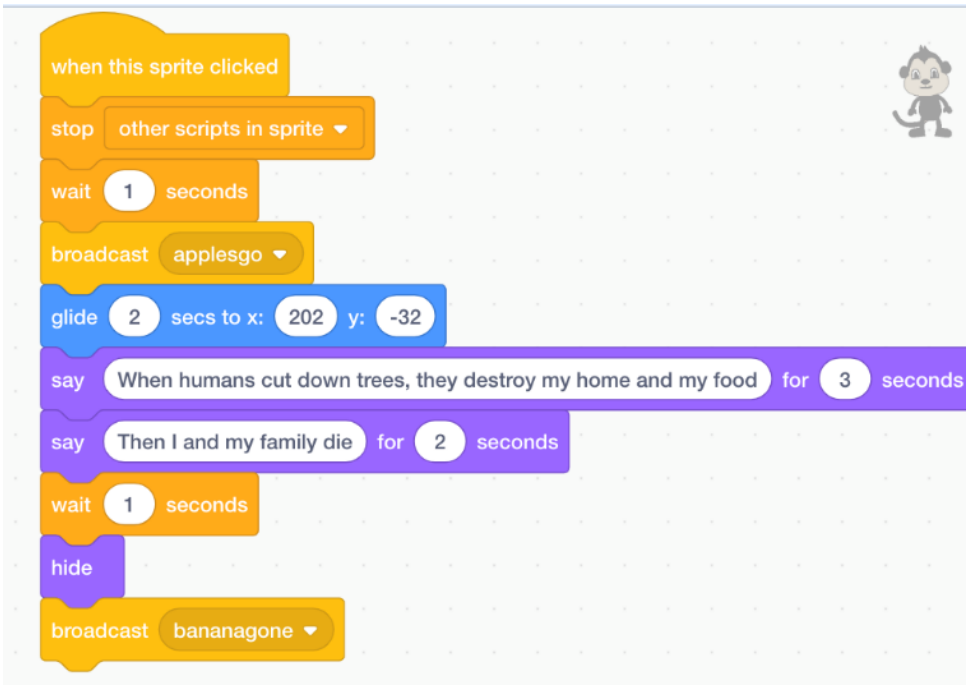
other scripts in sprite option in its drop-down menu

This will freeze all the other scripts of this sprite.

We will now build a script that will have the monkey come down from a tree, start the story of what happens when trees are cut down, and to have the fruit sprites, commencing with the apples 

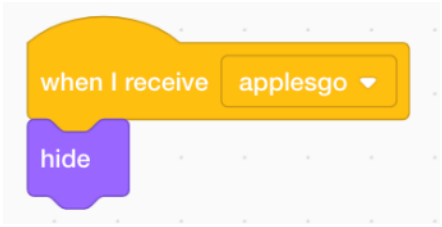
and bananas 

, begin to disappear from the screen.



The Apples

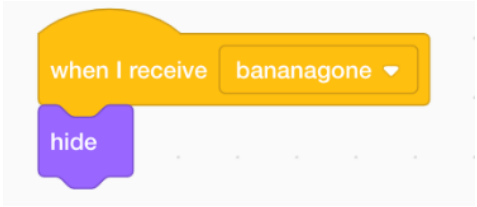
The broadcast message *applesgo* in the script above needs a complimentary script in each of the apple sprites which will make them disappear.



It also activates the script in some of the tree sprites starting the process of them disappearing also

The Bananas

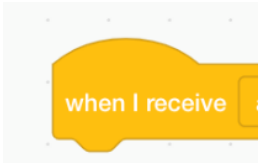
The broadcast message bananagone needs a complimentary script in each of the banana sprites which will make them disappear.



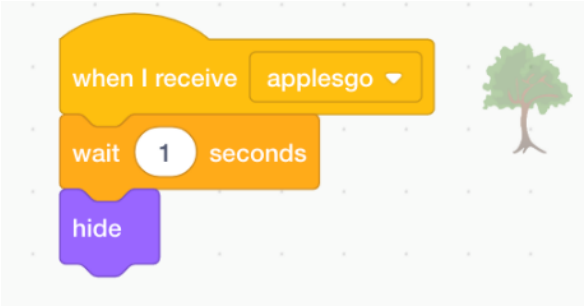
As with the previous broadcast message *applesgo*, *bananagone* also activates the script in some of the tree sprites.

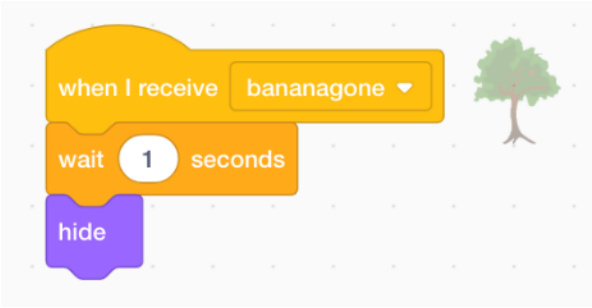
The Trees

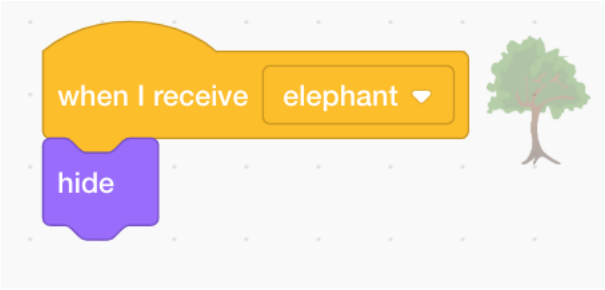
The trees in the forest will start to disappear on a phased basis as each of the flora and fauna scripts disappear.

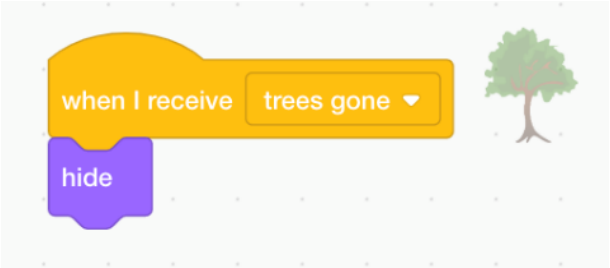
To achieve this, place different options in each of the 

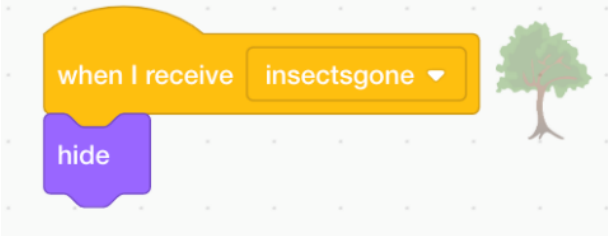
blocks placed in the individual tree scripts until all the trees are gone

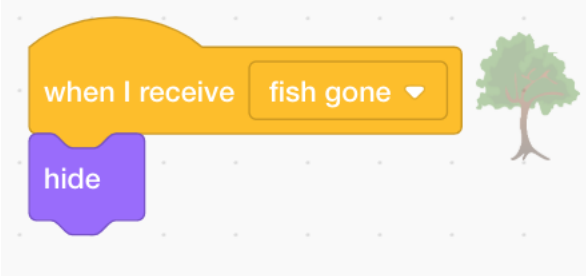


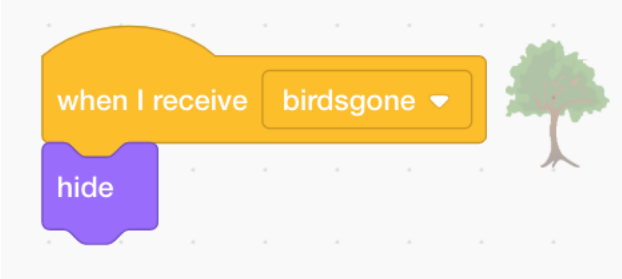






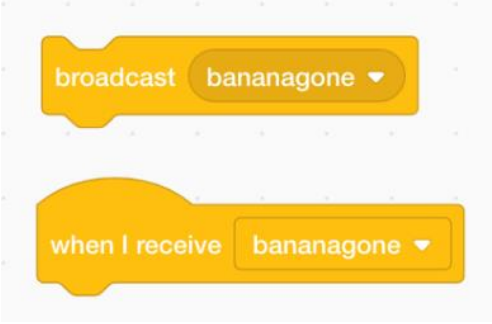


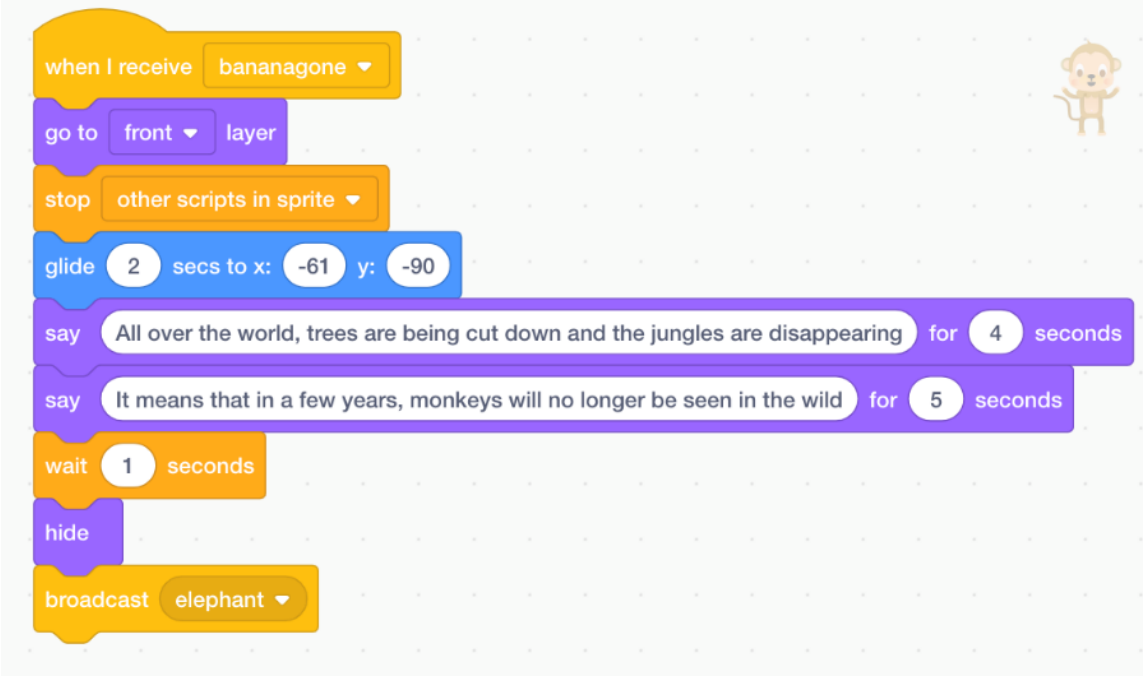




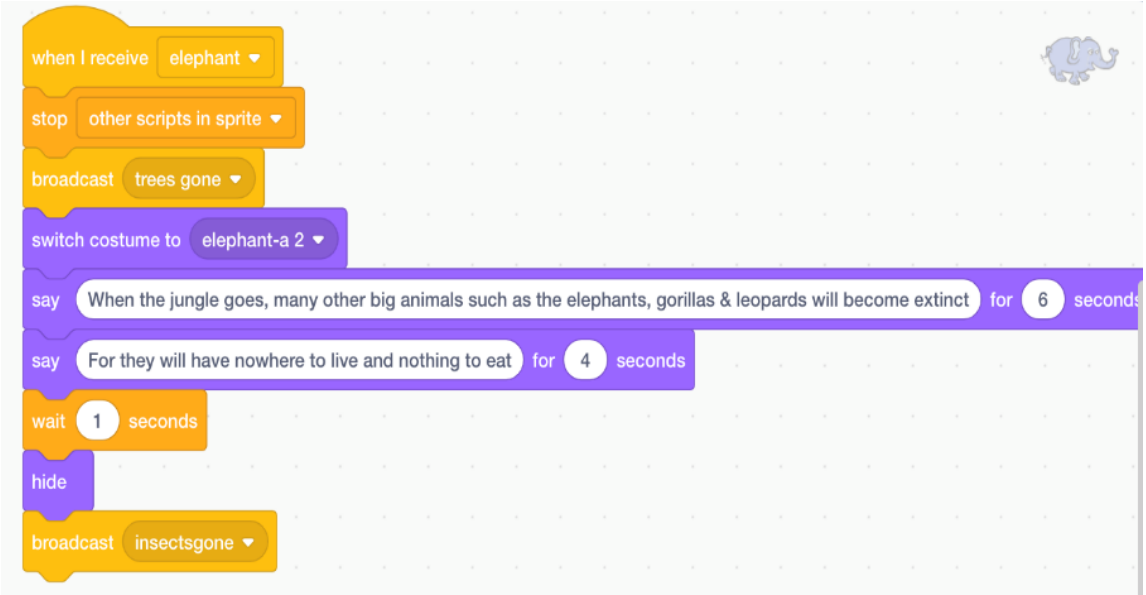
The Brown Monkey

The scripts are now following a pattern begun by the Black Monkey which is based on the send and receive structure of the Broadcast commands (blocks).

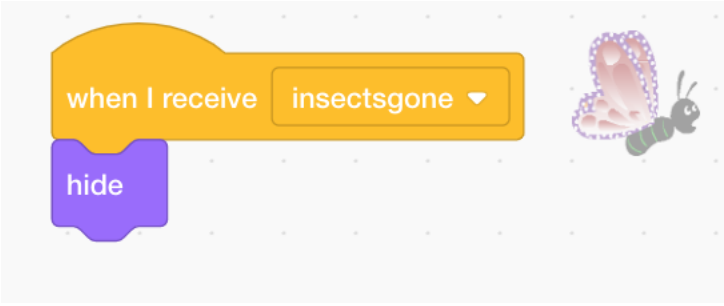




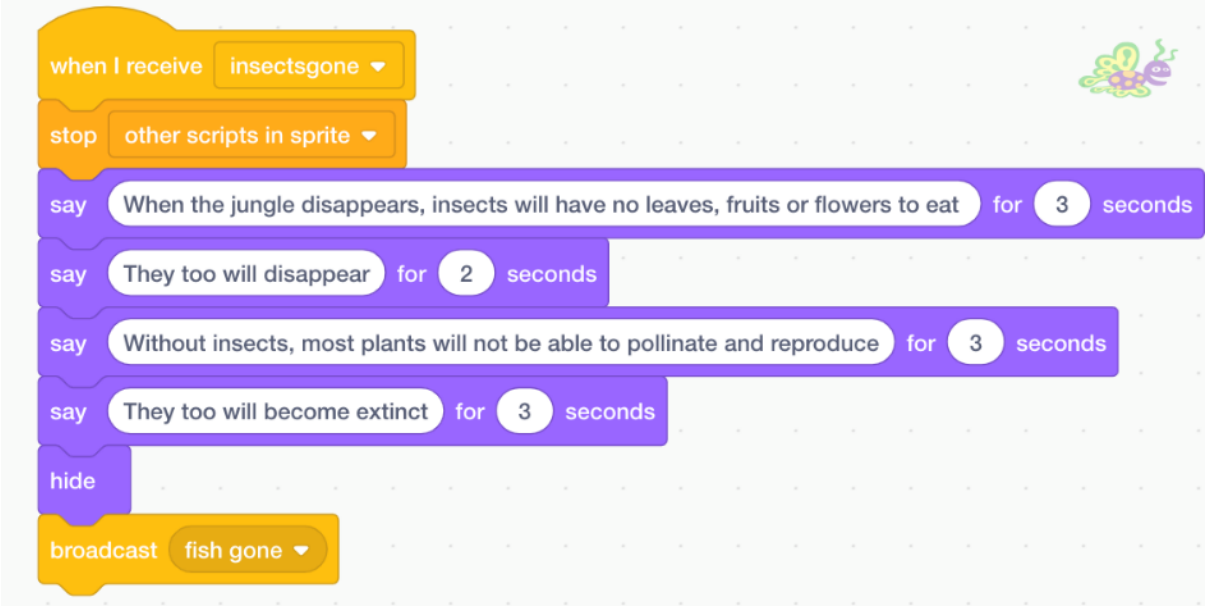
The Elephant



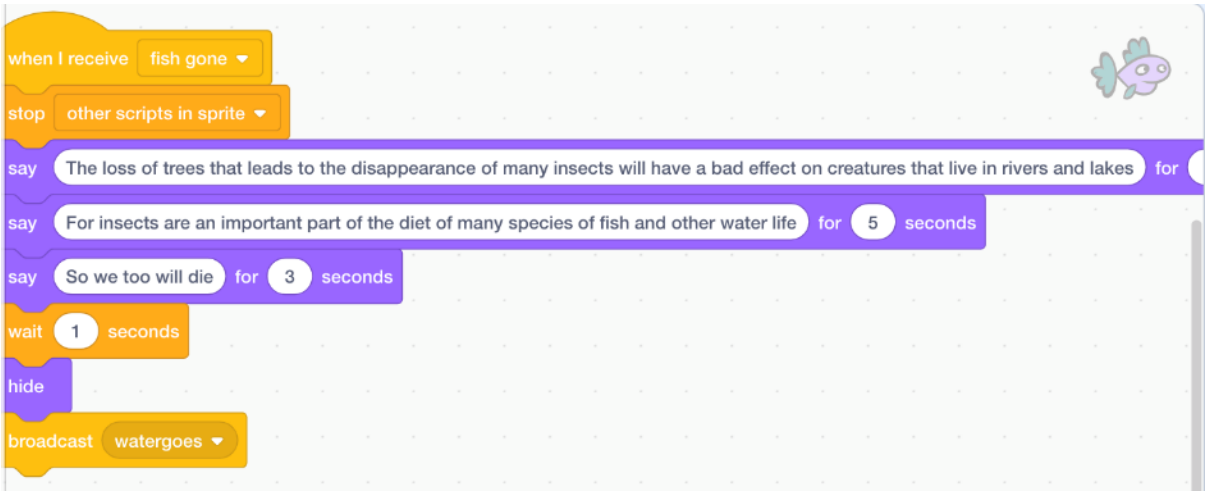
The Butterfly (1)



The Butterfly (2)

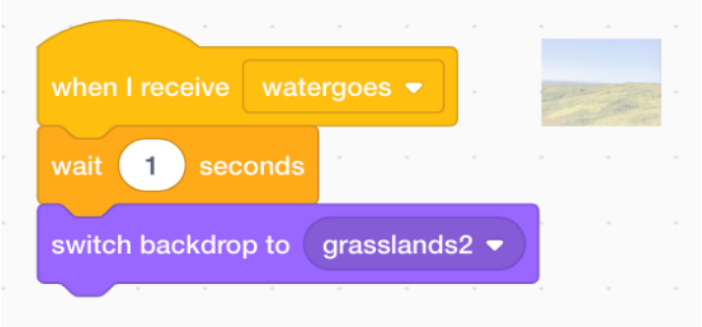


The Fish

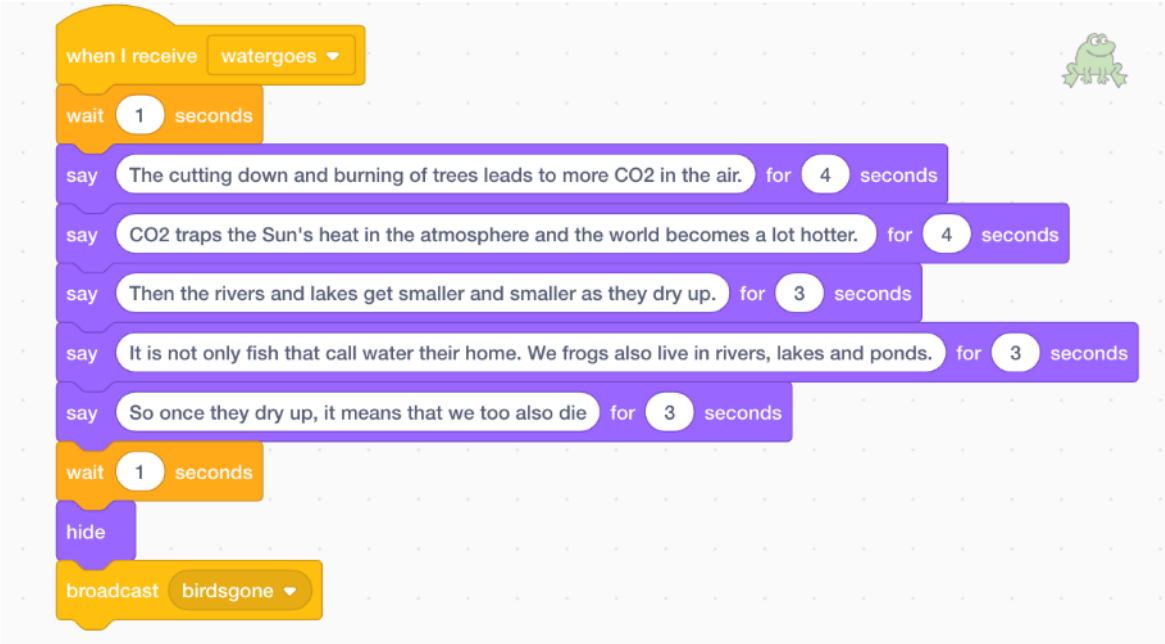


The Backdrops

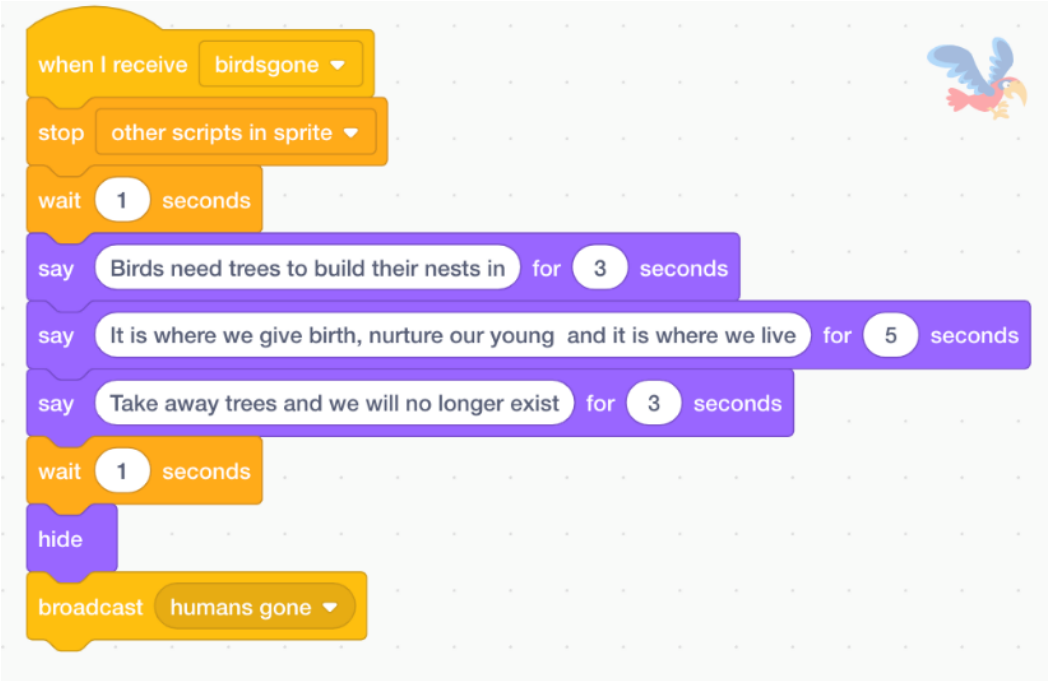
The *watergoes* broadcast message is also received by a Backdrops script in order to revert to the original grasslands backdrop before the water feature (river) was drawn in for the benefit of the forest backdrops.



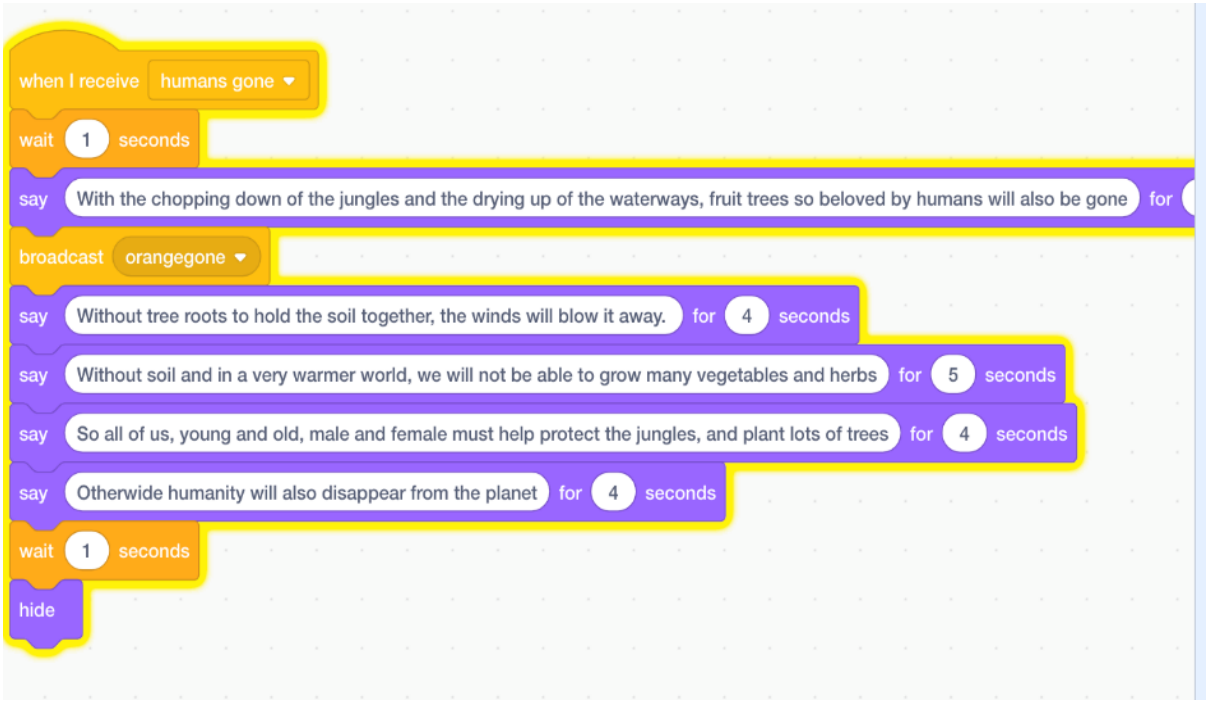
The Frog



The Bird



The Human (Narrator)



By the Way...

Please note once again that all the sprites, backdrops and scripts do not have to be used for this project. If you wish, pick what you are feel are best suitable for a shortened version of this powerful environmental message on the importance of trees to life on planet Earth.

The completed project is located on the ACW Mentors Scratch account at https://scratch.mit.edu/projects/411747582/

Project 6 – A Wildlife Quiz

'Question and Answers' are a key part of everyday life in a school classroom. The quiz game format is a simple but highly effective and indeed enjoyable way to test knowledge on a subject and to assess students' progress.

Getting the youngsters to co-create a quiz in Scratch will not only improve their coding capabilities but also allow them to develop a template that can be used across the educational curriculum. As well as enhancing their learning capabilities and interest in the specific theme being used in this project, the process involved should encourage teachers and students to use it in other subjects ranging from languages, geography, history to science.

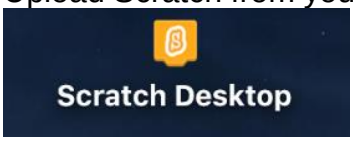
It is recommended that this exercise be followed up by getting the students individually or in small groups to develop their own quiz based on another topic or topics that they are currently studying. Researching the content matter and coming up with suitable questions should be a challenging but nevertheless rewarding and fun undertaking for all involved. The completed quizzes can then be tested out amongst all the students of the classroom.

Project Research & Design Summary

The Wildlife Quiz to be developed in this project will be based on questions related to the behaviour and habitats of four animals. By clicking on any of the fauna sprites, the user will be shown a number of interesting facts on the specific species. Then the user will go to a new section where he/she will be asked a question with the answer to be chosen from multiple choice options.

In preparation for the coding of this demonstration project, the necessary research into the lifestyles of four animals and selection of appropriate quiz questions was carried out.

Upload Scratch from your computer by clicking on

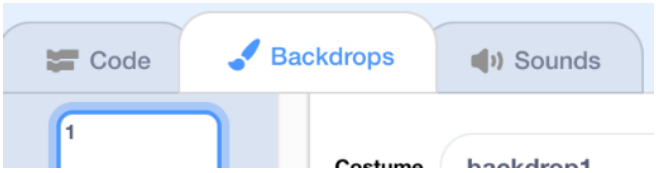


Delete the cat sprite.

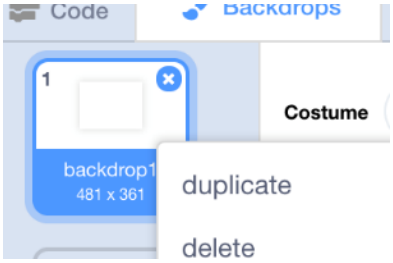
The Backdrops

Go to **Backdrops** in the **Stage** section.

Then click on **Backdrops** in the menu (below) to the top left of the screen



Duplicate *backdrop1* by right clicking on the mouse/keypad



Stay on *backdrop2*

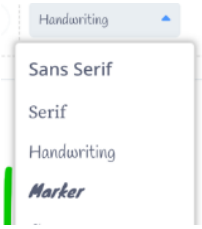
In the **Costume** name label, change the name from *backdrop2* to *homepage*

In the **Canvas** area, type out the wording *Wildlife Quiz* by

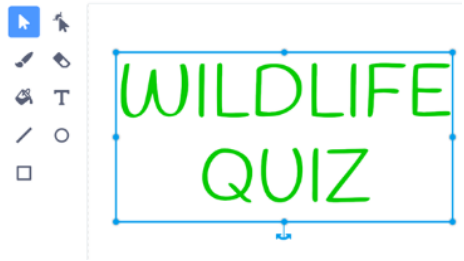
first clicking on **T** in the **Tools Menu** of the **Vector** option

Select a suitable colour in Fill

and a suitable font in



The text can be decreased or increased in size using the tool at the top left hand first column of the Tools Menu



and then, using the same tool, it can be moved around the stage to secure a suitable location.

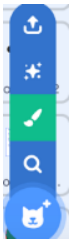
Whilst the text should indeed be large, nevertheless ensure that enough space on the stage is allocated for the placement of animal sprites.

As aforementioned, four wild animals (monkey, elephant, lion and octopus) will be chosen for this Wildlife Quiz.

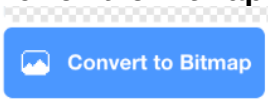
Select four suitable sprites and manually position them on the stage leaving a large gap towards the bottom third of the stage. This space will be filled by an instructional box sprite.

The ‘Instruction Box’ sprite

Go to the Make New Sprite option of the drop down Sprite Menu located towards the bottom right side of the Scratch Interface

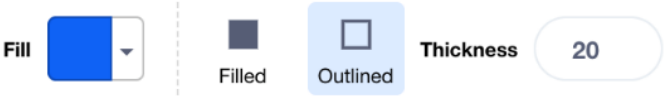


Click on the **Bitmap** option below the Canvas



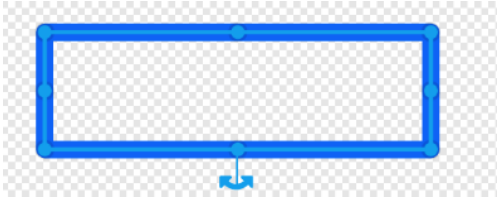
Select  in the Tools Menu

Then choose colour (*Fill*), *Outlined* structure and line *Thickness* in



The depth (thickness) of the boundary line can be adjusted by changing the number in the latter box (it is 20 in the sample shown above)

Draw box outline



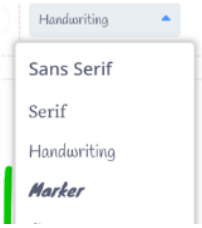
Move the rectangle box whilst still in edit (box) mode

Go to the **Vector** option

Click on **T** in the Tools Menu

Select a suitable colour in Fill

and a suitable font in



Type the following (or similar text): *Click on an animal to find out some interesting facts about it and to take part in our wildlife quiz.*

Move the sentence into the rectangle box and adjust the text to fit using the blue pointers.

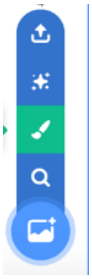
The text can be decreased or increased in size using the tool at the top left (first column) of the Tools Menu

At present the text and box move independently.
To unite the two elements together, select

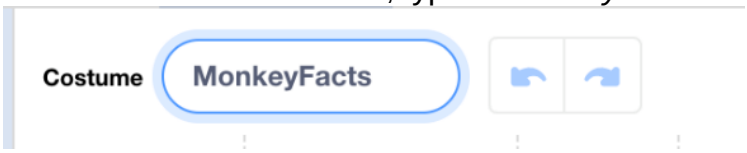
Drag this tool from top left hand corner to the bottom right hand corner and move the object. The text and box are now operational as one entity.

The Monkey's 'Facts Box' backdrop

Click on  (*Make New Backdrop* option) in the drop-down Backdrops Menu  located towards the bottom right side of the Scratch Interface



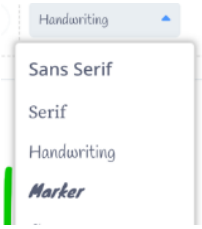
In the Costume name label, type in *MonkeyFacts*



Click on **T** in the **Tools Menu** of the **Vector** option

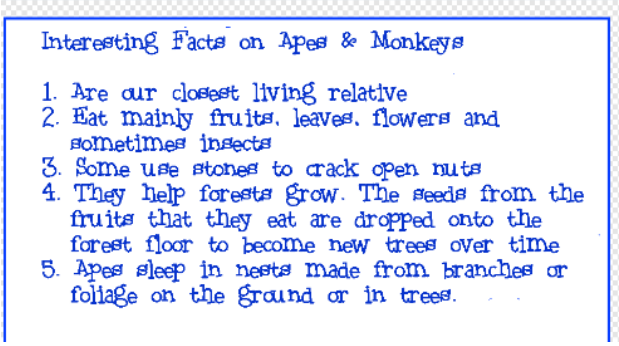
Select a suitable colour in Fill

and a suitable font in



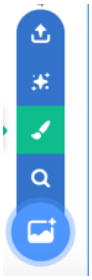
The text can be decreased or increased in size using the tool at the top left of the Tools Menu. But endeavour to have it fill up the stage screen.

Creating a boundary line surrounding is an optional feature with the procedure the same as in the instructions of the previous sprite.



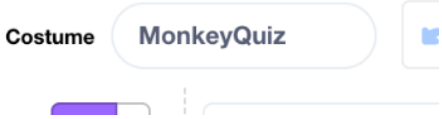
The Monkey's Question & Multiple-Choice Answers backdrop

As with the previous backdrop, click on (Make New Backdrop option) in the drop-down Backdrops Menu located towards the bottom right side of the Scratch Interface

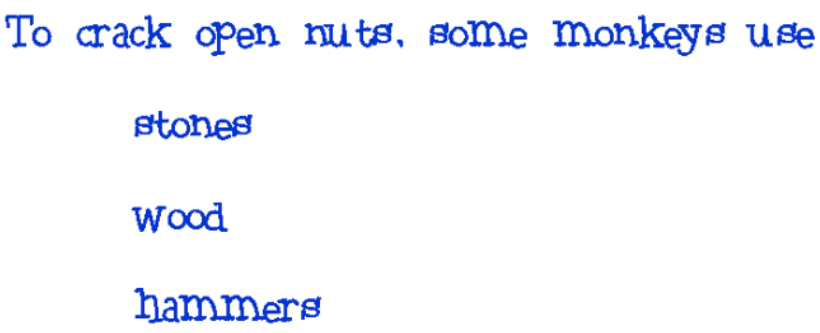


Follow the same procedure to compose a question with multiple choices (three) from one of the five facts on monkeys and apes that comprised the last backdrop.

Name this backdrop MonkeyQuiz



However leave appropriate spacing to the left of the three options (stones, wood & hammers) as shown below.

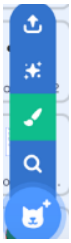


This is because three coloured circle sprites representing answer icons will be placed in these spaces.

The Monkey's Coloured Circles of Answer sprites

Create a different coloured circle sprite beside each of the three possible answers

To do so, go to the *Make New Sprite* option of the drop down Sprite Menu of the Scratch Interface

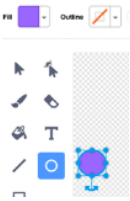


Click on the  in the **Tools Menu** of the Vector option

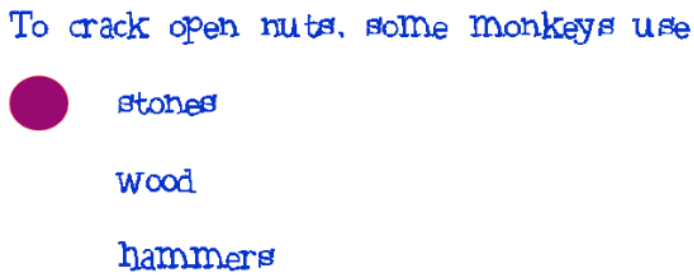
Select a suitable colour in Fill

To get rid of any outline boundary of a different colour, bring the number to zero (0) in box beside Outline and Fill

Adjust the circle to a suitable size

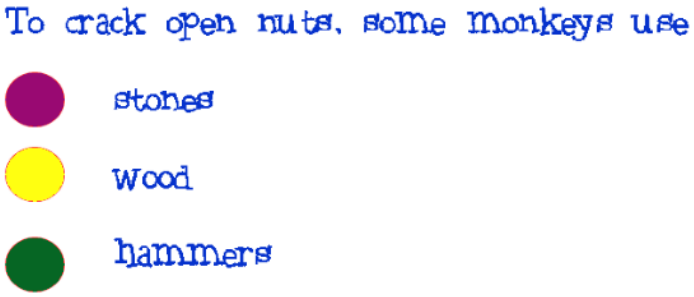


Position the coloured circle to the left of the first text answer of the **Multiple Choices Backdrop**



Follow the same procedure to create two more circle sprites, each one positioned against separate Answer options.

If one wishes to do so, each circle could have a different colour.

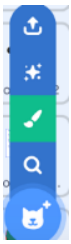


The ‘Arrow Instruction Text Box’ sprite

To have the user move from the page displaying the facts on monkeys and apes to that containing the Question with multiple choices, we need to create two new sprites. The first will contain brief instructions on how to go to the latter page; the second will be the Arrow icon that the user touches to undertake the move.

To build an arrow instruction box, we will once again follow the same procedure as was done with the ‘Instruction Box’ sprite.

Go to the *Make New Sprite* option  of the drop down Sprite Menu  located towards the bottom right side of the Scratch Interface



Click on the **Bitmap** option below the Canvas

Select  in the Tools Menu

Then choose colour (*Fill*), *Outlined* structure and line *Thickness* in

Draw box outline

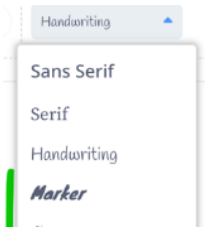
The depth of the boundary line can be adjusted by changing the number in the box labelled **Thickness** in the **Line bar.**

Move the rectangle box whilst still in edit (box) mode
Go to the **Vector** option

Click on **T** in the Tools Menu

Select a suitable colour in Fill

and a suitable font in



Type the following (or similar text): Click on Arrow to go to Quiz

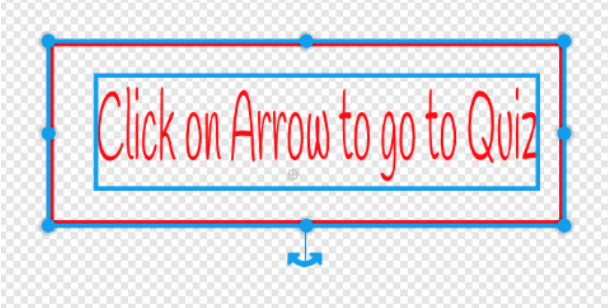
Move the sentence into the rectangle box and adjust the text to fit using the blue pointers.

The text can be decreased or increased in size using the tool at the top left of the Tools Menu

At present the text and box move independently.

To unite the two elements together, select 

Drag this tool from top left hand corner to the bottom right hand corner and move the object. The text and box are now operational as one entity.



The Arrow Sprite

Go to the Make New Sprite option of the drop-down Sprite Menu and select the library (magnifying glass) icon

Then click on the Arrow sprite

Select the costume with the direction pointing right

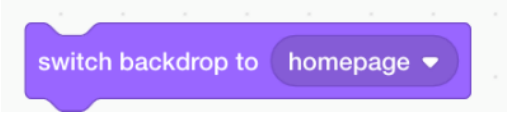
Go to Fill, and the paint bucket icon in the **Tools Menu** should you wish to change the colour of the arrow.

At this stage it is time to commence inputting the code (instructions)

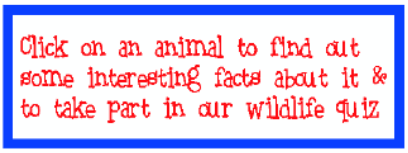
The 'Homepage' Backdrop (costume)

Drag and drop from the **Control** category into the **Workspace**

connecting to it the following block from the **Looks** category



The ‘Instruction Box’ sprite



Ensure that the Instruction Box sprite is in the correct location on the **Stage**.

To have it appear when the quiz starts, go to **Control** category and drag and drop the Green Flag block into the Workspace**.**

From the **Motion** category select the go to X____ and Y____ block. Scratch automatically picks up the present coordinates of the sprite.

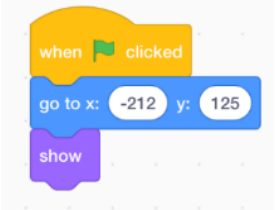
Go to **Looks** category and drag and drop the show block into the Workspace. This is because this sprite (as with the four animal sprites) should be on view when the quiz starts.

The script should appear as follows

The Monkey sprite

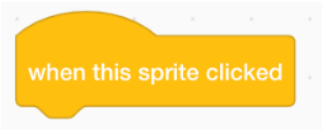
Follow the same procedure using a similar script as was undertaken with the **Instruction Box** sprite.

Once again ensure that the sprite is in the correct location on the **Stage**.



As per the onstage instructions, clicking on the monkey needs to bring up a new screen displaying interesting facts about this type of animal

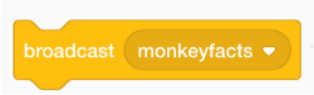
To allow this to happen, first go to **Events** and select



This command needs to be followed by an instruction that will lead to the Interesting *Facts on Apes and Monkeys* backdrop appearing

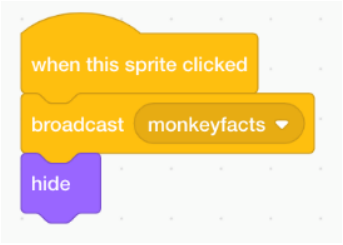
As heretofore, we use the broadcast command blocks for this task.

Go to broadcast block and under **new message**, type in *monkeyfacts*



Drop it into the Workspace placing it underneath the previous block.

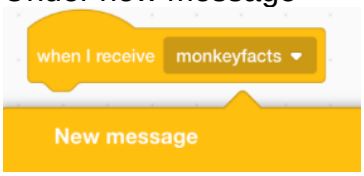
Then take *hide* from the Looks category and connect as follows:



The Monkey should also disappear when any of the other three animal sprites are clicked.

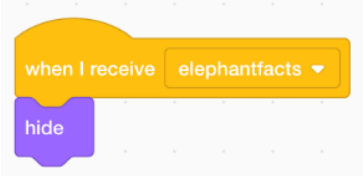
So return to Events and select the when I receive _____ block

Under new message



Type in *elephantfacts* and place this block in the Workspace.

Go to Looks category, select hide and connect it to the previous block.

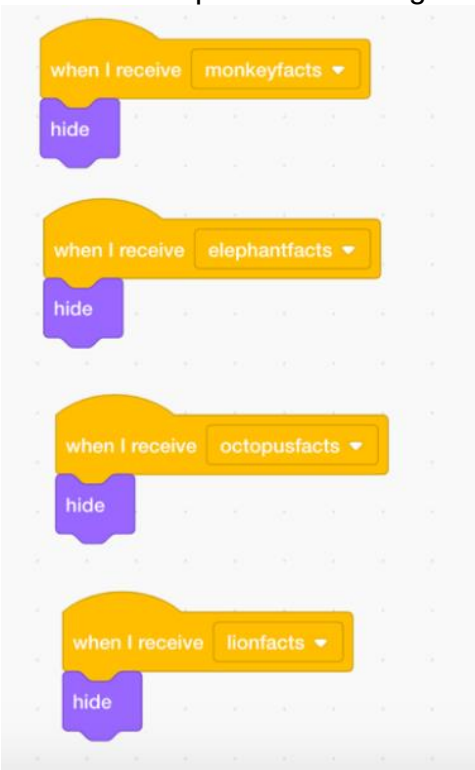


Repeat this process to create broadcast command blocks for *octopusfacts* and *lionfacts*.

The ‘Instruction Box’ sprite

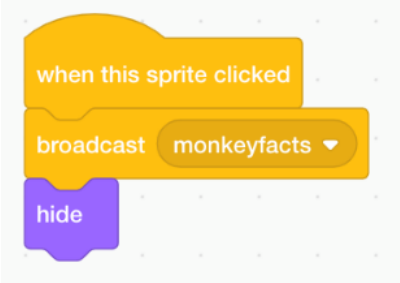
The ‘Instruction Box’ sprite should also disappear when any of the four animal sprites are clicked.

So likewise input the following short scripts

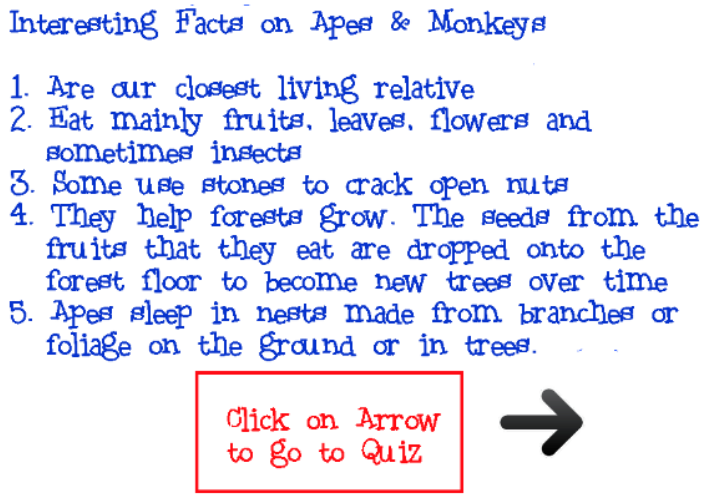


The Monkey’s ‘Interesting Facts’ Backdrop (costume)

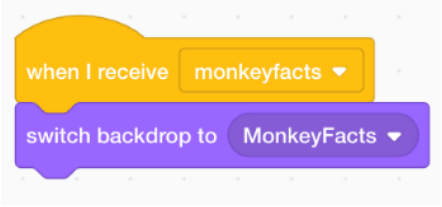
As a result of the script



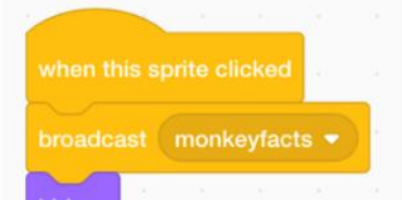
the stage should now switch to



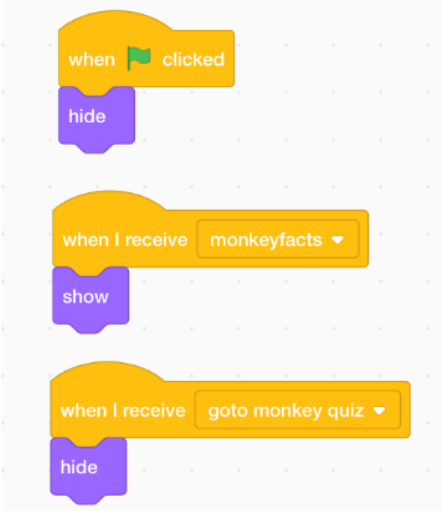
To ensure that this screen appears in response to the broadcast *monkeyfacts* block in the Monkey script, we need to input a corresponding broadcast *when I receive monkeyfacts* block in a script within its Workspace



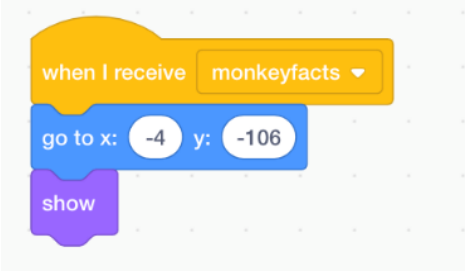
The 'Arrow Instruction Text Box' sprite

The Arrow Instruction Text Box sprite should be hidden when the Home Page is shown; appear only with the Monkey's 'Facts Box' backdrop as a result of the script in the Monkey sprite 

; and should likewise disappear when the **Arrow** sprite is clicked by the user to move forward to the Question and Answer Quiz section. So use the following three scripts to achieve the desired results



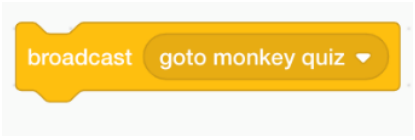
However, as it is a sprite (rather than a backdrop), it needs the addition of an X and Y coordinate block to ensure that it appears in the same location every time. (Just in case that it was accidently moved manually).



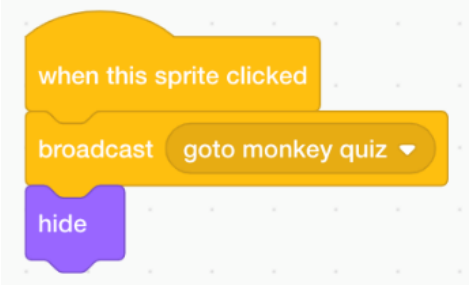
The Arrow sprite

The Arrow sprite should function very similarly to the Arrow Instruction Text Box sprite, though having different X and Y coordinates

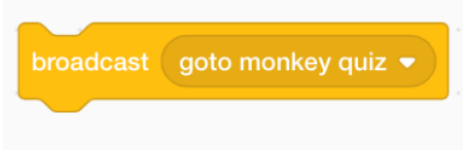
However the touching of the ➔ sprite is the mechanism that brings the user to the Question and Multiple Choice Answers section.

Hence 

will form part of the following script

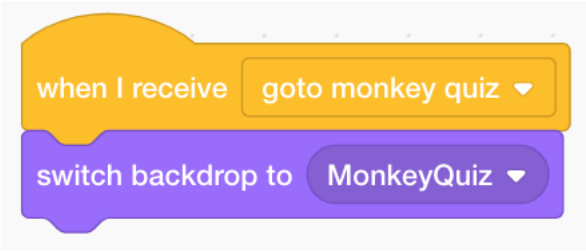


The Monkey Quiz Backdrop (costume)

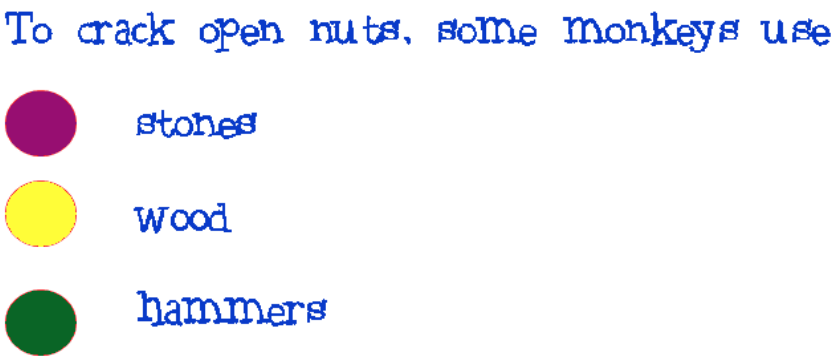
In response to the 

in the Arrow script (above)

the following script should be inserted in the Backdrop code



which will lead to the appearance of **MonkeyQuiz** backdrop costume:



The Coloured Circles of Answer Sprites

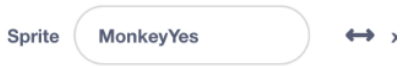
There are three choices offered as the answer with only one being correct.

Hence we have to delineate in the code the two wrong answers from the correct one. Furthermore, the students need to be encouraged to continue until they select the right option in order to improve their knowledge of the subject matter.

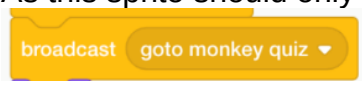
The 'Correct Answer' Sprite

Let's start with the correct option, namely the  sprite beside the stones text.

Rename this sprite *MonkeyYes* in the section directly under the stage in the Scratch Interface



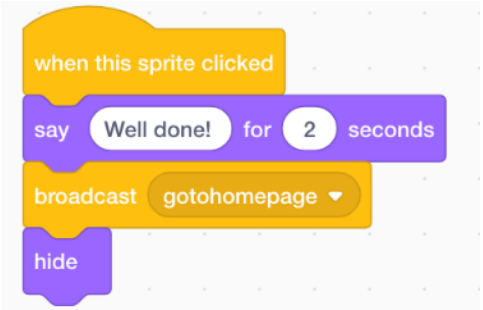
As this sprite should only appear onscreen in response to the

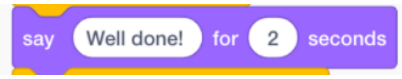


in the Arrow script, then the following needs to inputted into its Workspace

The inclusion of the X and Y coordinates block above is critical as the sprite has to be positioned beside the word *stones.*

Once the user selects this option the project needs to return to the Home Page so that he/she can choose another animal to continue with the quiz.
Hence the following will form the third and final script for this sprite



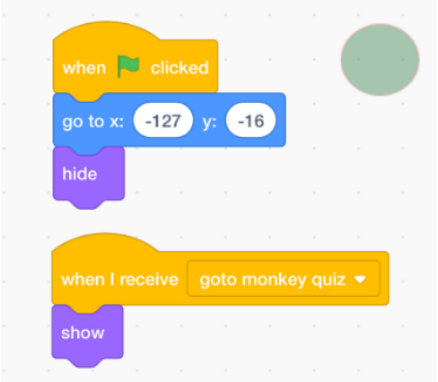
The 

block above confirms for the user that he/she has chosen the correct answer.

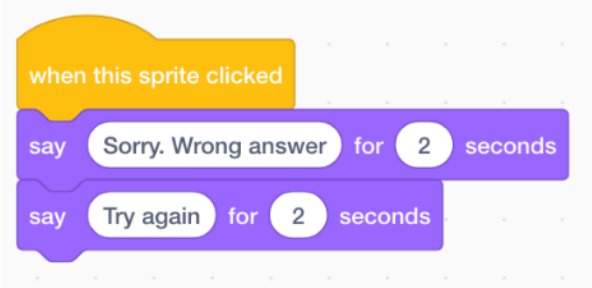
The 'Wrong Answers' Sprites

Rename these two sprites *MonkeyNo1* and *MonkeyNo2*

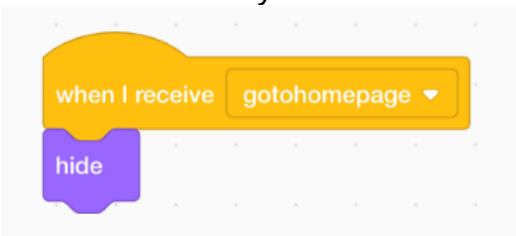
Both sprites will have two scripts similar to that in *MonkeyYes*



However, as clicking on either of these two sprites represents the wrong answer, the following needs to be inserted in both



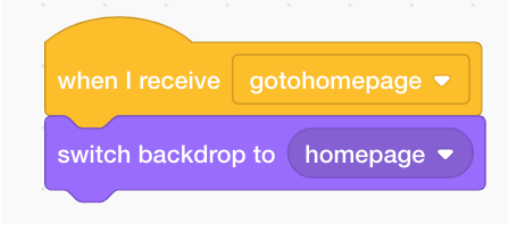
When the user gets the correct answer by clicking on the *MonkeyYes* sprite a broadcast needs to go to *MonkeyNo1* and *MonkeyNo2* in order to have them disappear from the stage.
This is achieved by the inclusion in both of the following script



The MonkeyQuiz Backdrop (Costume)

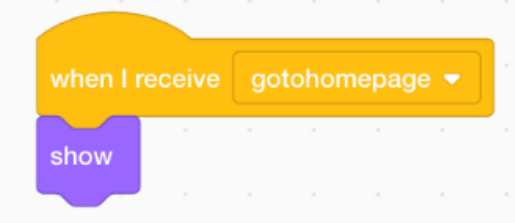
The final script for the Backdrop in this series linked to the Monkey sprite is to have the MonkeyQuiz screen (costume) replaced by the HomePage (with Wildlife Quiz title)

So combine a new broadcast command in Events of *when I receive gotohomepage* with *switch backdrop to homepage* from Looks



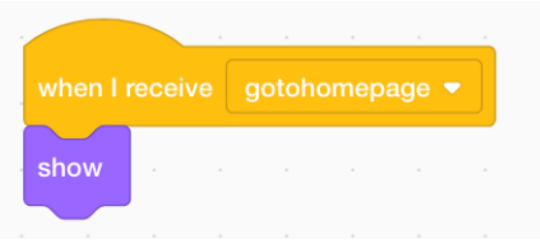
The Monkey Sprite

The final script for the Monkey is a code that will have this sprite reappear after the multiple-choice quiz question is answered correctly.
To have it show onscreen along with the Home Page backdrop costume as well as with the other three animals and the Instruction Box sprite, combine the *when I receive gotohomepage* command with the *show* block from Looks

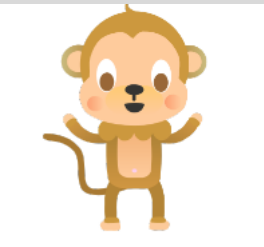


The ‘Instruction Box’ Sprite

In this sprite, the same *when I receive gotohomepage* and *show* blocks are required to have the Instruction Box show onscreen when the Home Page appears



Coding the Elephant, the Lion & the Octopus – Follow the Monkey!



A similar coding process to the monkey, from clicking on the animal sprite to moving to the ‘Interesting Facts on Monkeys’ screen to taking part in the subsequent ‘Question & Multiple Choice Answer Quiz’ and finally returning to the Home Page (backdrop), has to be undertaken for the elephant, the lion and the octopus.

Each animal sprite has to have new associated (connected by broadcast commands) elements:

- ‘Interesting Facts’ backdrop
- Arrow sprite
- ‘Question & Multiple-Choice Answers’ backdrop
- Three circle answer (one correct and two incorrect) sprites.

The ‘Arrow Instruction Text Box’ sprite and the Home Page backdrop also require additional coding blocks to be integrated into the process for each animal.

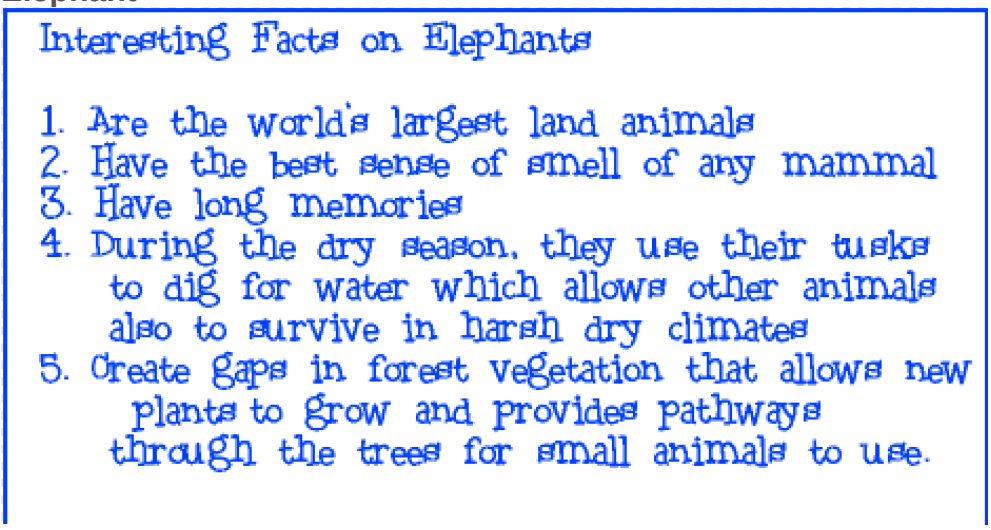
So the message is quite clear – Learn from the Monkey and follow its example!

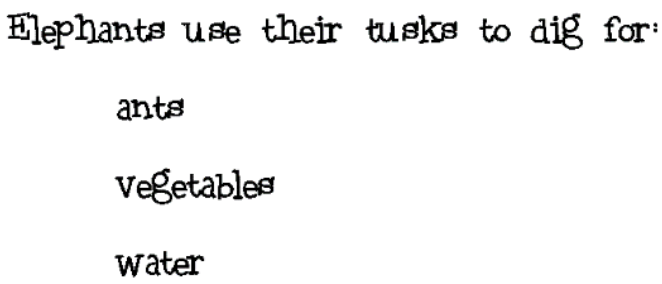
Exercise

The students can now independently or under the teacher’s guidance undertake the coding of the three other animal sprites and associated elements.

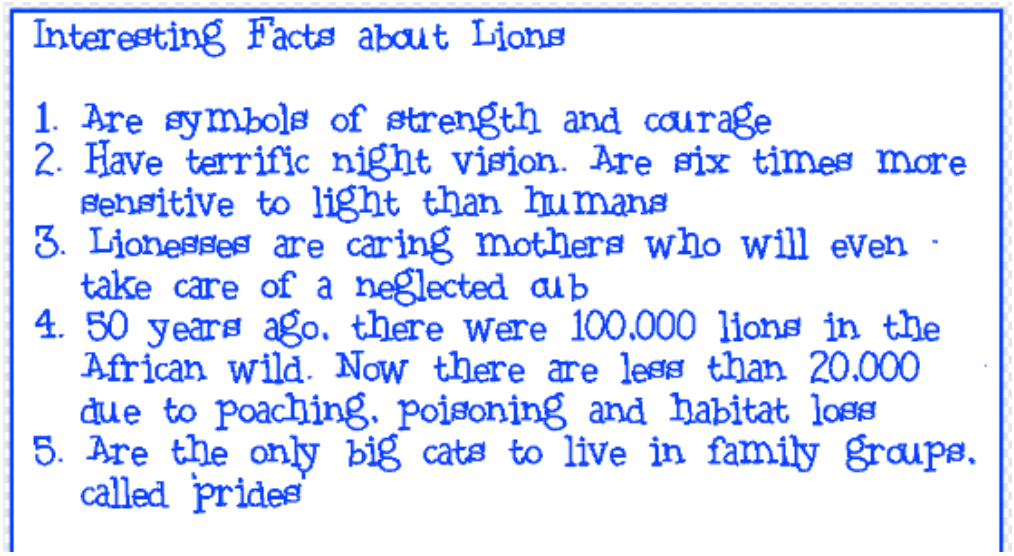
To help in the process, here are the *Interesting Facts* and *Question & Multiple-Choice Answers* screens for the elephant, the lion and the octopus.

Elephant





Lion



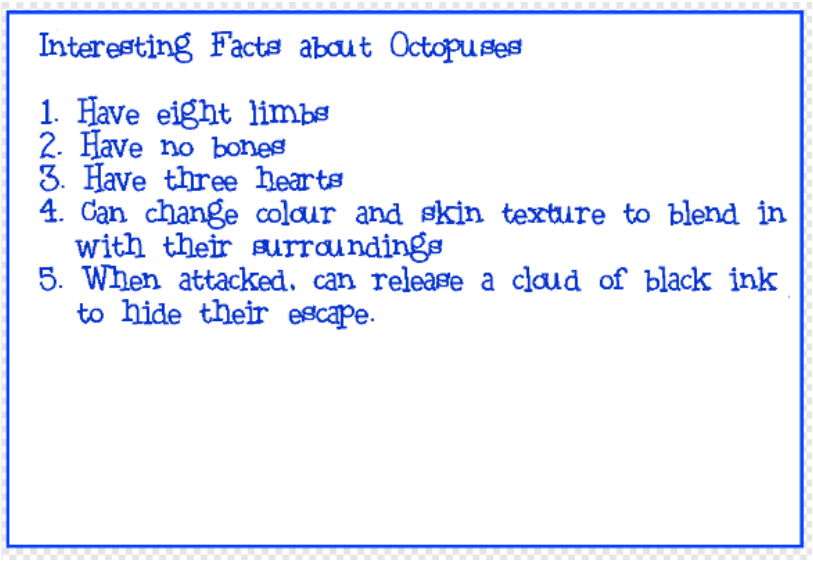
A family group of lions is called a:

herd

pride

swarm

Octopus



To protect itself from an attacker, an octopus can

fire a spray of water

release a cloud of black ink

use its limbs to throw stones from the ocean floor

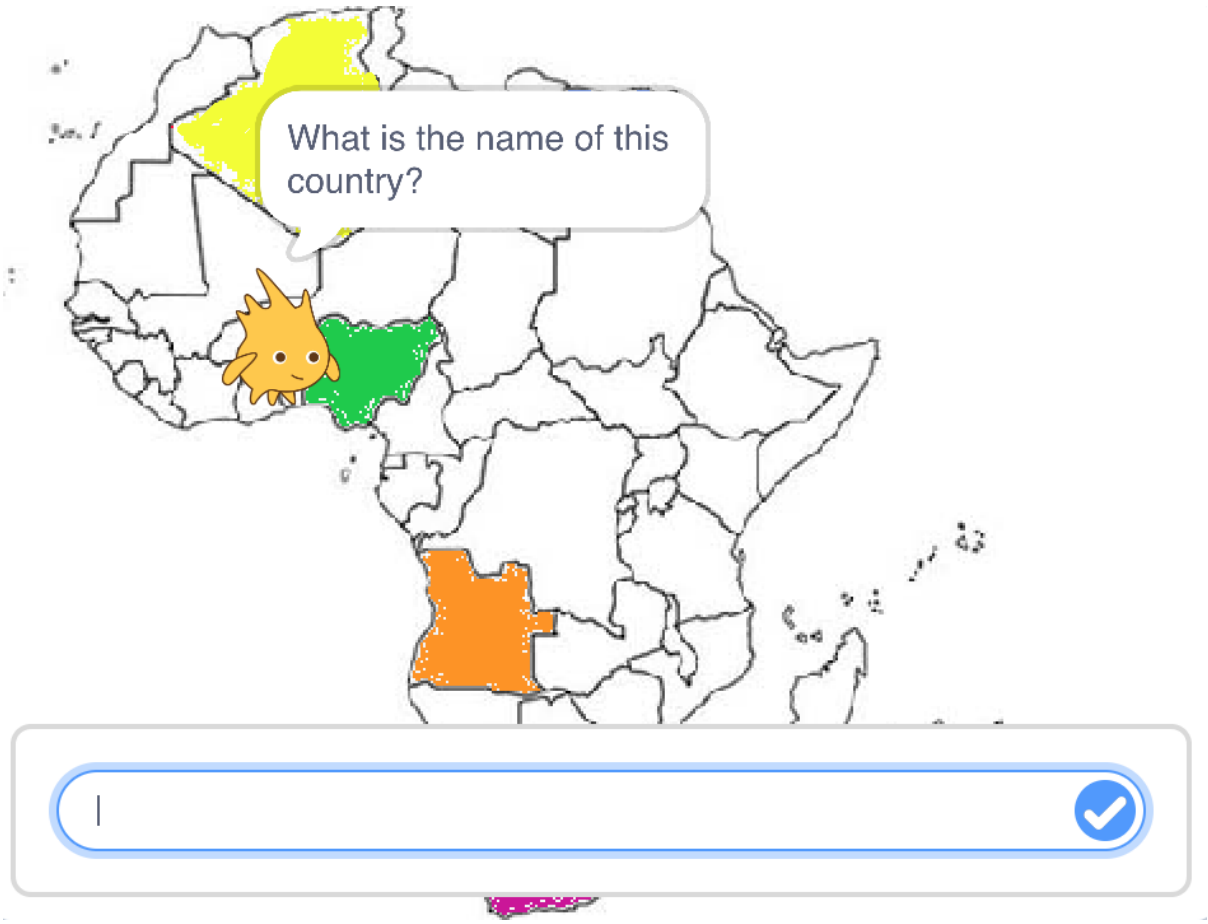
By the Way...

The completed project is located on the ACW Mentors Scratch account at https://scratch.mit.edu/projects/414137108/

Project 7 – A Geography Quiz

As with the example shown in project six, the quiz game format can be an enjoyable way for young people to test their knowledge on a subject and for teachers to assess their progress.

The sample project below shows one way of how it can be used in geography. It represents a tour of Africa with the questions based on the names of the countries. Of course, it could instead involve naming the main languages, capitals, mountains, rivers, lakes, etc.



Project Play - Coding Plan Summary

The tour guide is Gobo who travels across Africa stopping off at different countries. At each stop he asks the user to name the country.

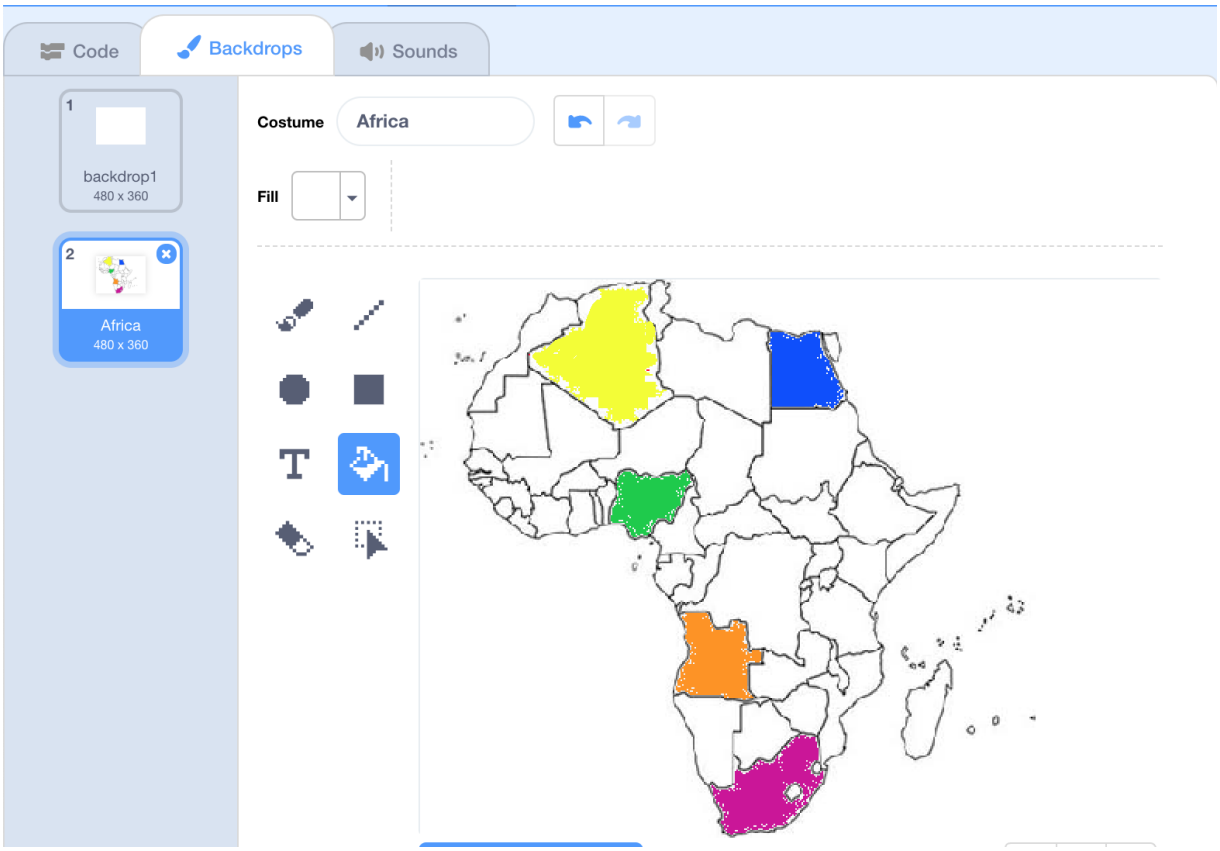
The respondent cannot move from the country until he/she types in the answer correctly. Once the correct answer is inputted, Gobo travels to the next country to ask the same question until all highlighted countries are visited.

Requirements

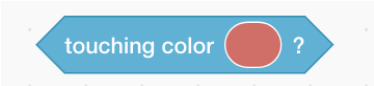
One **sprite** (Gobo) and one **backdrop** (Map of Africa) with only scripts being used in the former.

Map of Africa Backdrop
The map should consist of the continent of Africa with only the national boundaries of each country outlined.

Go to the **Costumes** option of the Backdrop and use the **paint brush** or the **fill** options in the **Tool Box** to colour in a number of countries, giving each one a different colour.

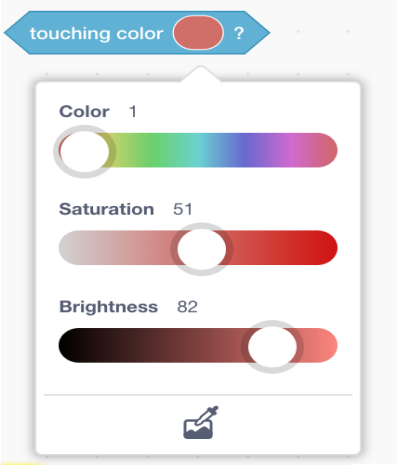


It is the actual *colour* that will define the country in the coding process.

This is achieved by first selecting the 

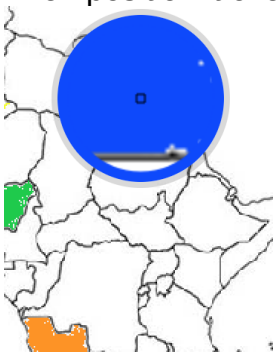
block in the **Sensing** category and dropping it into the relevant script of the sprite. (*all code is placed in the Workspace of the Gobo sprite*).

The specific colour that the country is shaded in is chosen by first right clicking on the colour shading in the block

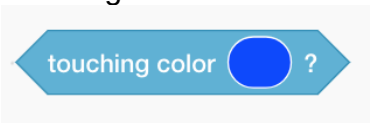


Select the eye drop icon  at the bottom of the drop-down box that now appears.

Then position it over the coloured country that you have selected.



Click once and the result is that the colour will now appear in the box within the touching colour block.



Repeat this process for each country.

Warning!
Ensure that as the sprite moves from country to country, it is does not touch another coloured country as the colour will trigger the code.

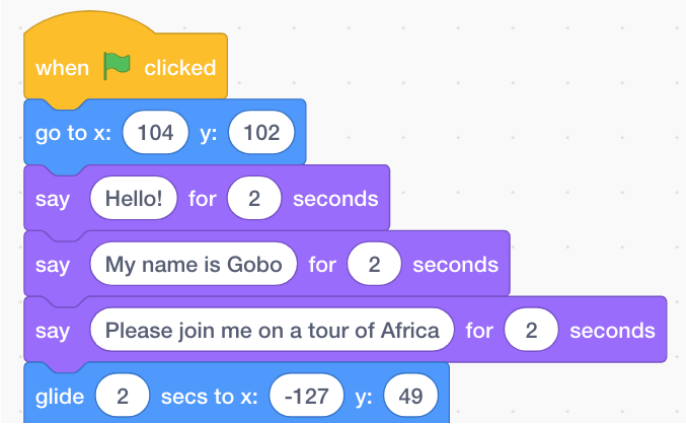
Blocks used in this project will be located in the *Control, Looks, Motions, Sensing* and *Operations* categories

Unlike the detailed text instructions of the previous five projects, we will use image representations of the scripts.

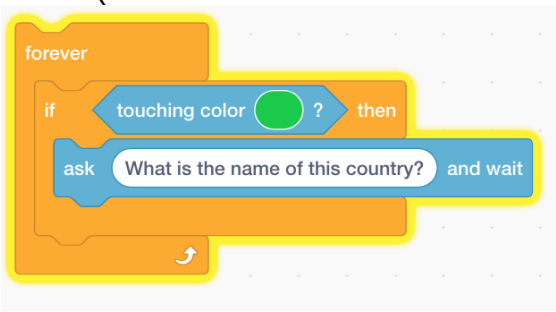
Below are the stages of building the scripts

Script 1:

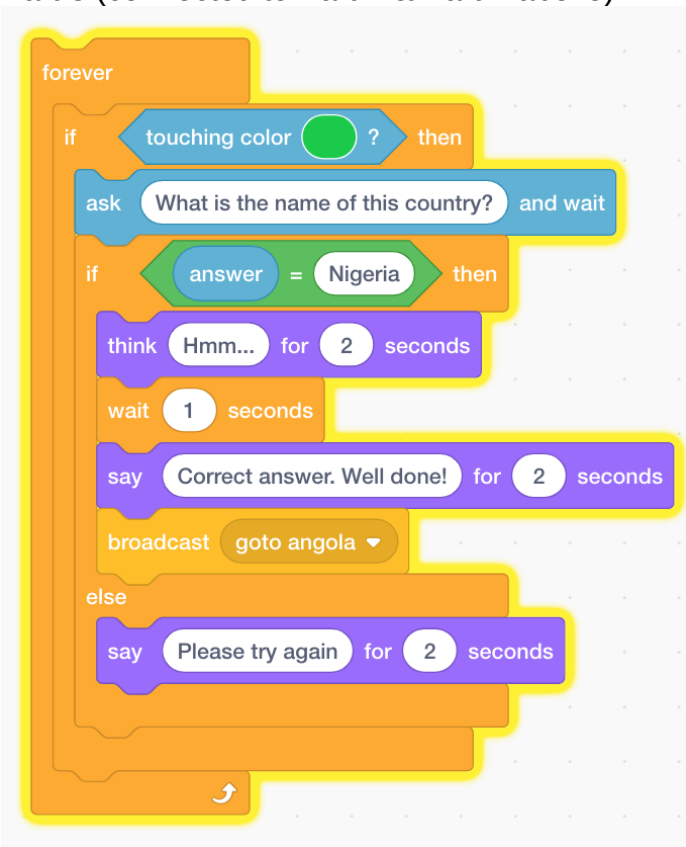
Part 1



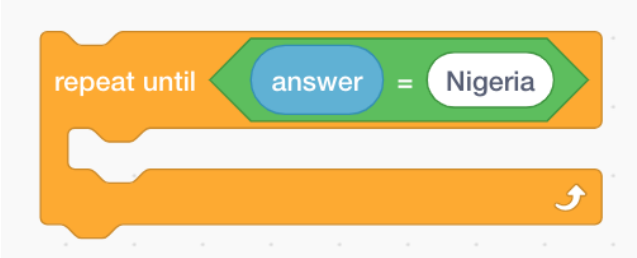
Part 2 (connected to the Part 1 blocks of code above)



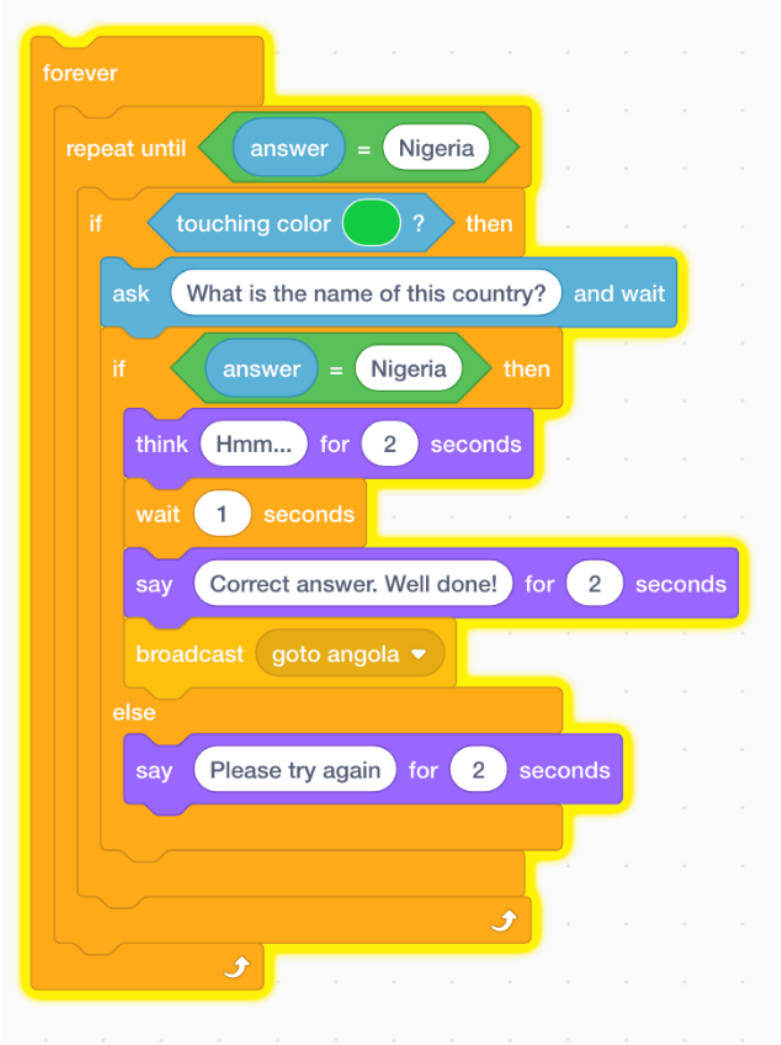
Part 3 (connected to Part 1 & Part 2 above)



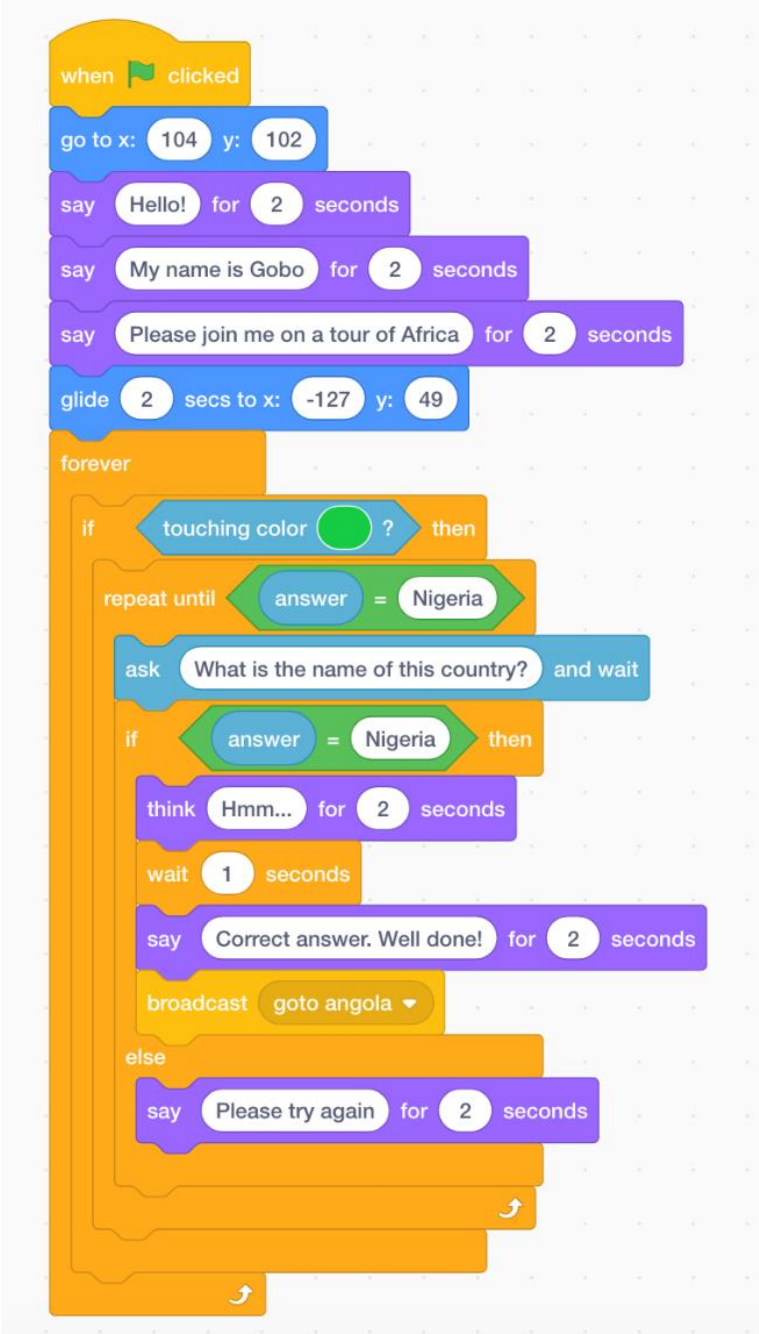
Part 4



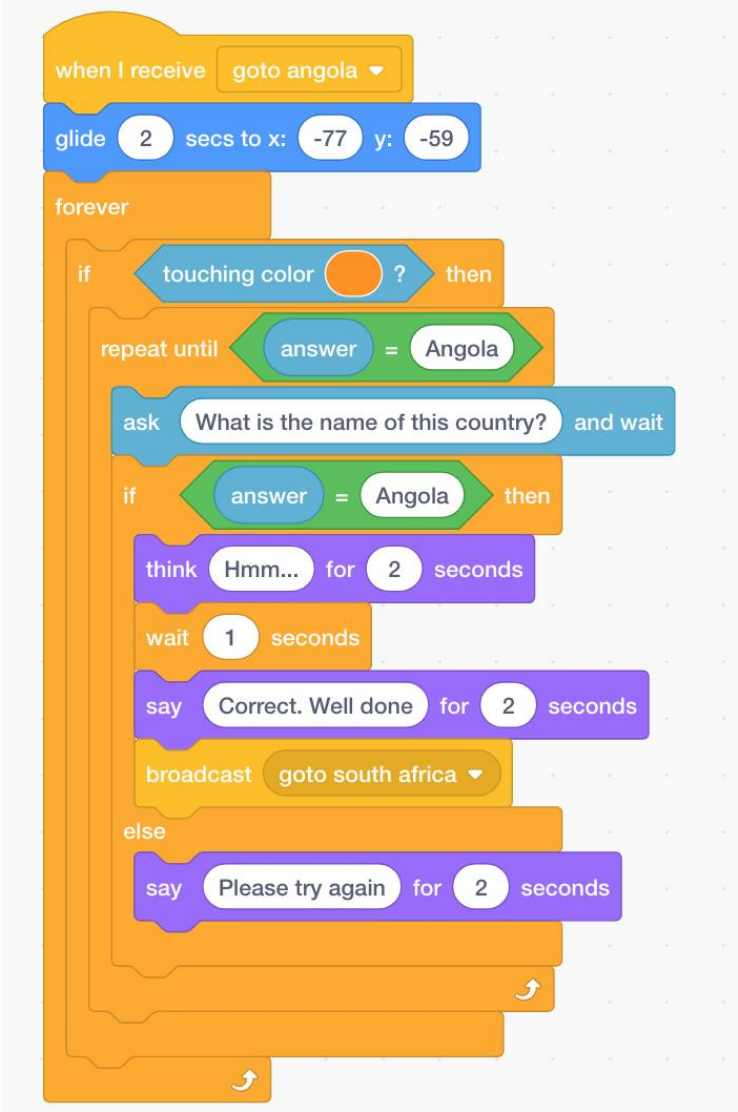
which is combined within Part 3 above to give



The complete script (Part 1 to 4) will then be



Script for the country *Angola*



Follow the same procedure for all the other colour highlighted countries.

Exercise

Get the students, as individuals or in groups, to make a similar project based on the countries of another continent.
This may involve them independently or together with you undertaking advanced research and planning in order to obtain the necessary relevant information (e.g. capitals of countries, or languages spoken, or geographical features such as main rivers, mountains, etc).

By the Way...

The completed project is located on the ACW Mentors Scratch account at https://scratch.mit.edu/projects/421888920/