Module 3

Module 3

Suggested Duration of Module

4 Hours

Objectives

Module 3 will cover:

Exploring numeracy in Scratch

Problem Solving

Drawing in Scratch

Discussion Time

Exploring Numeracy in Scratch

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

Variables and the Operators

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

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

Participant Activity – Find the Product of two numbers

1. Create two variables where we will store numbers inputted by the user. Here we have named them "Number 1" and "Number 2".
2. Use the Sensing Palette to ask the user to type a number. The blue question and blue answer enables people to add user interaction to their projects.
3. These numbers will be saved as variables.
4. The green Operator's Palette will allow us to multiply the two numbers together.
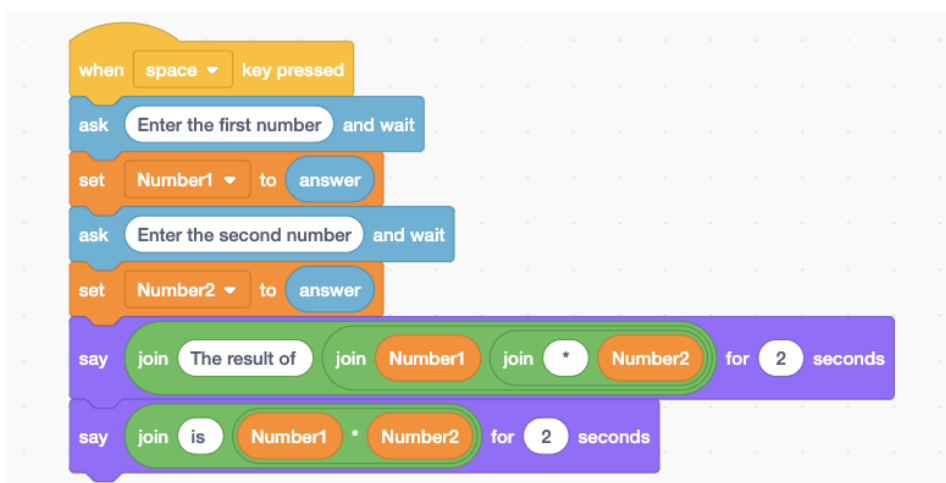
Alternatively you could make this into a quiz by changing it slightly.
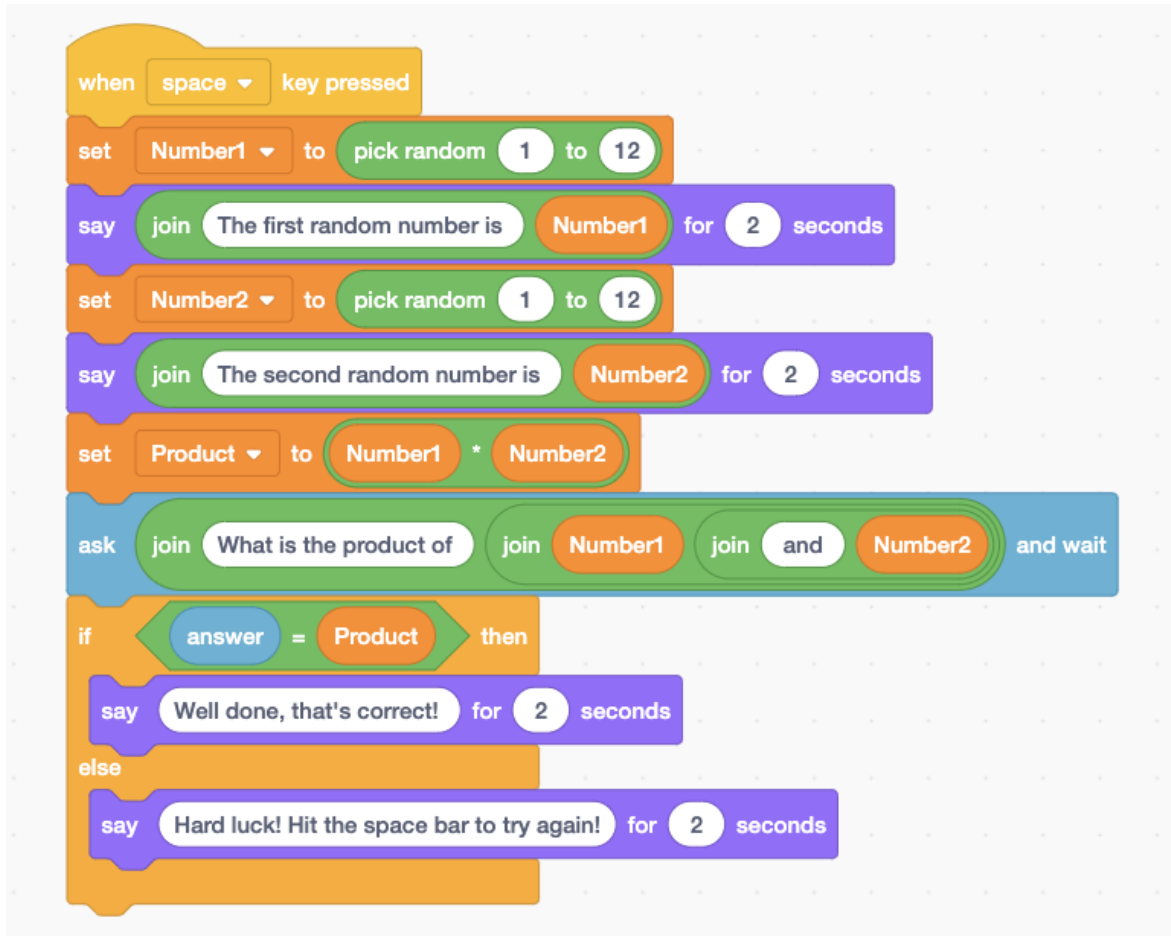
5. Alter the above code to make addition, subtraction and division tasks.
6. Modify the code to allow the user to choose what type of operation is performed.
7. Take note of the nested join statements and experiment with them.
8. Save your work.

Participant Activity – Find the Area of a Shape

This lesson uses Scratch to calculate the area of a square or rectangle.
1. Create 2 variables, one called Length, the other Width.
2. Allow the user to enter the values for length and width. You will use the blue "ask" and "answer" block from the sensing palette.
3. Use the Operator's palette to find the area.

4. Output the answer onto the screen.
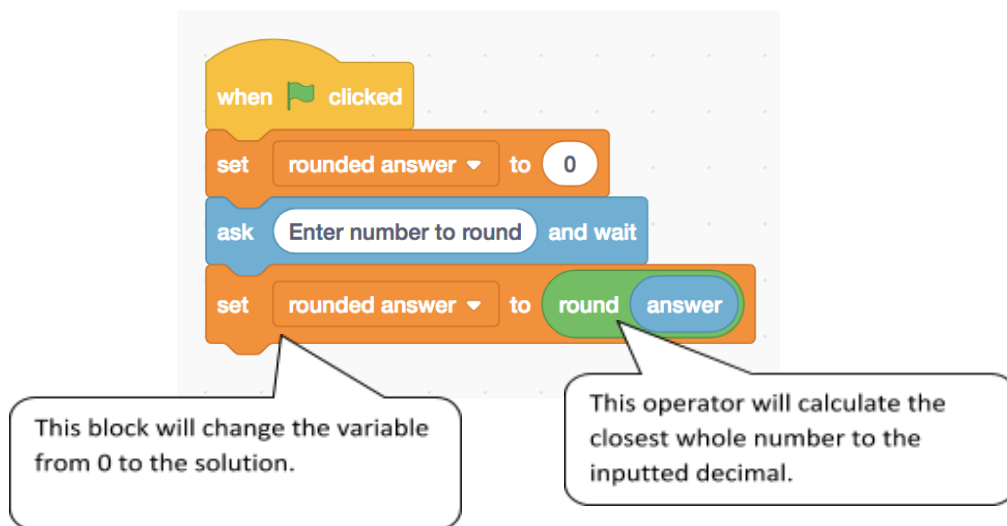

1. Initialise length and width variables to 0.

2. Use the sensing palette to ask the user for the length and width. at 0.

3. Set the length and width variable to these new values.

4. This piece of code calculates the area and shows it on the screen.

Participant Activity – Rounding Numbers

1. Click on stage and then click on backdrops.
2. Choose a backdrop from the library.
3. Select a sprite. You may delete the cat if you use another sprite. This sprite will ask the user to input a decimal and will give the rounded answer.
4. The script will use a variable and operators. We will call the variable "RoundedAnswer" as this is what we are looking for. The first block, "set RoundedAnswer to 0" will ensure that, each time we run the script, the initial value will be 0.
5. The sprite must ask the user to input a decimal.
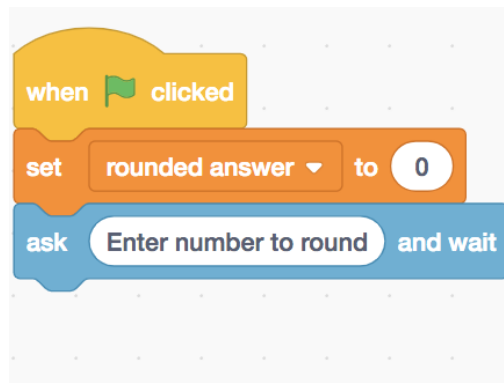
6. The blue block asks a question of the user and the response is saved in the blue "answer" block. This answer can then be used in various calculations. In this case we will round it to the nearest whole number and output the solution as the variable "RoundedAnswer".
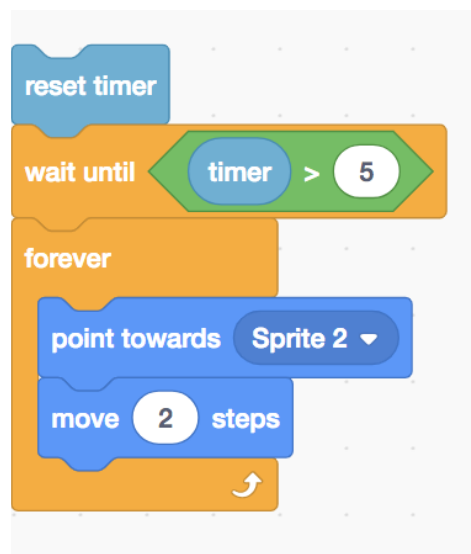

This block will change the variable from 0 to the solution.

This operator will calculate the closest whole number to the inputted decimal.

7. We must now display the solution on the stage.
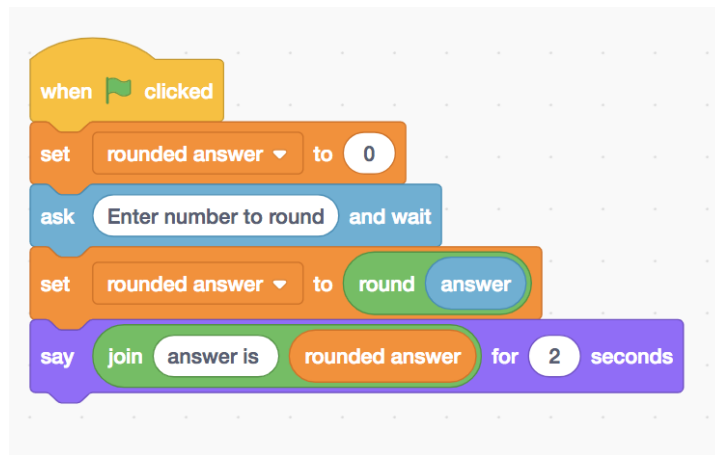
Timers in Scratch

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

Participant Activity

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

Random numbers

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

random locations, to assign random numbers of lives,

Cloning

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

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

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

If we look at the code in the first example above we can see that the cat sprite moves across the screen and every 50 steps he tells the palm tree to create a clone of itself.
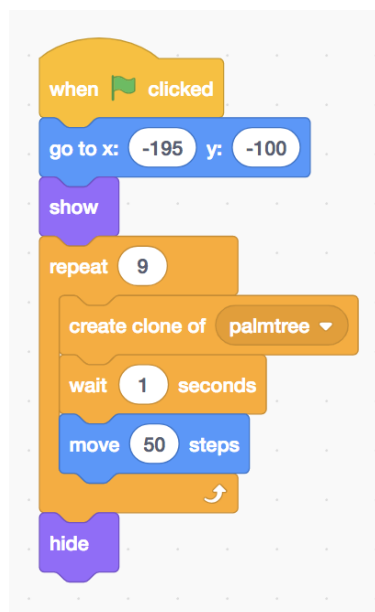
If we then look at the palm tree sprite we can see that when it is created as a clone it waits a random length of time and a selects a random size for the tree.
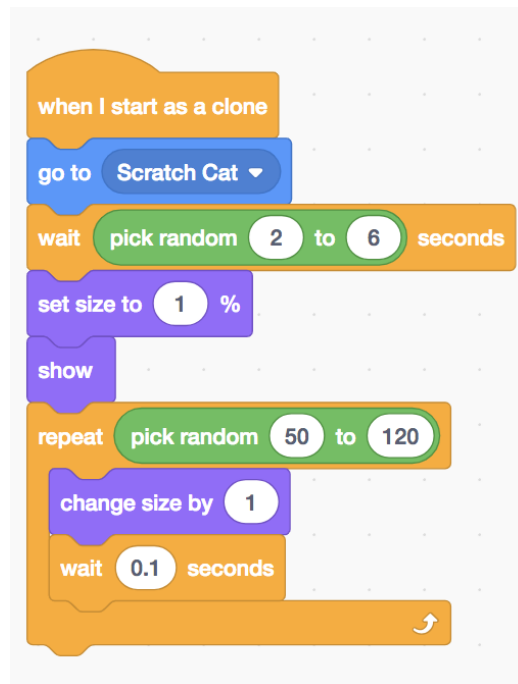
Participant Activity – Create a project using the clone functionality

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

Problem Solving

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

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

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

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

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

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

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

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

"So you think you can count" http://scratch.mit.edu/projects/19247368/

"Lámh Lámh Eile" http://scratch.mit.edu/projects/19325973/

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

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

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

Drawing in Scratch

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

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

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

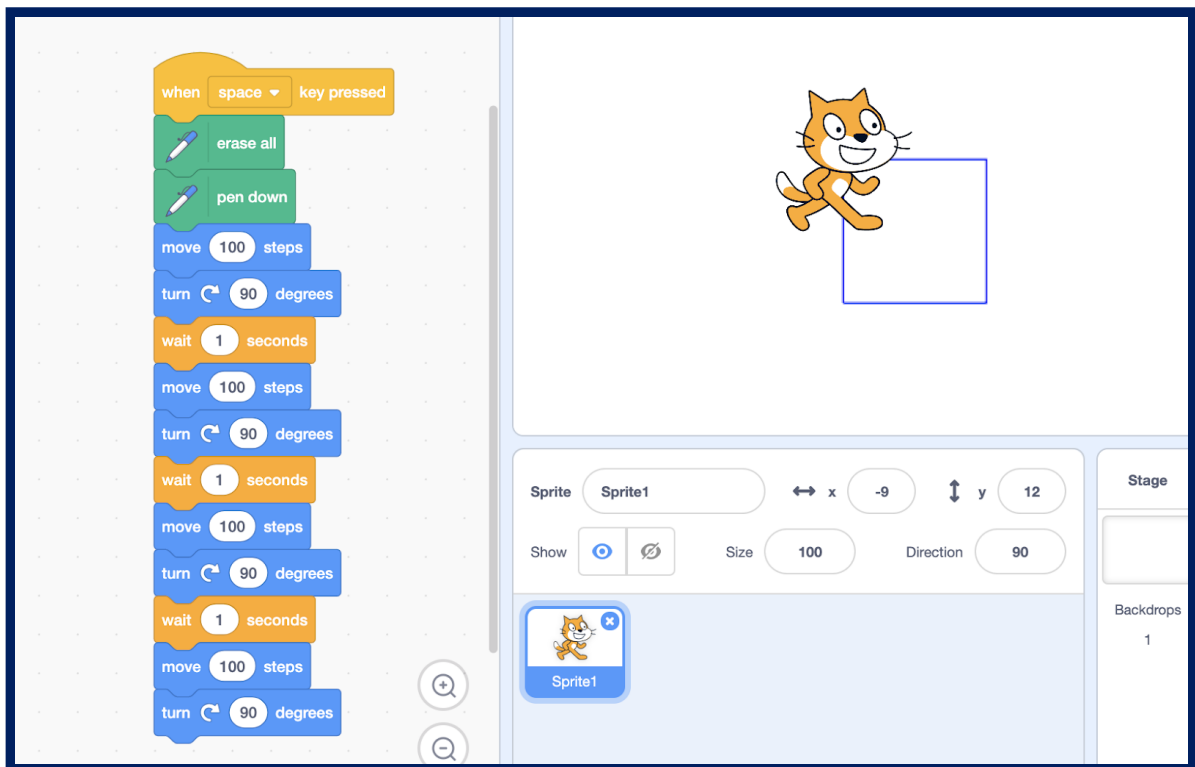The Pen Palette, found under extensions, contains the blocks we will use for drawing.

Participant Activity - Draw a square

1. Use an Events block.

2. Add the "pen down" block.
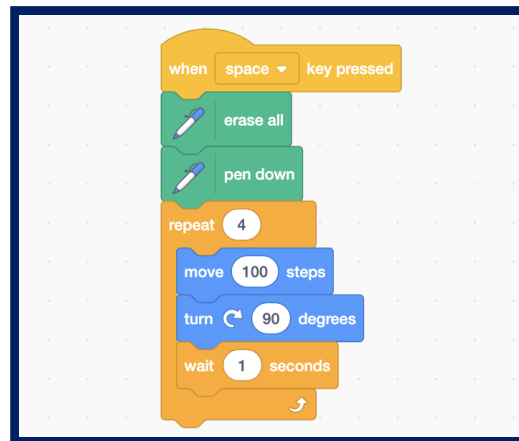3. Using the Motion Palette, walk the sprite in a square.
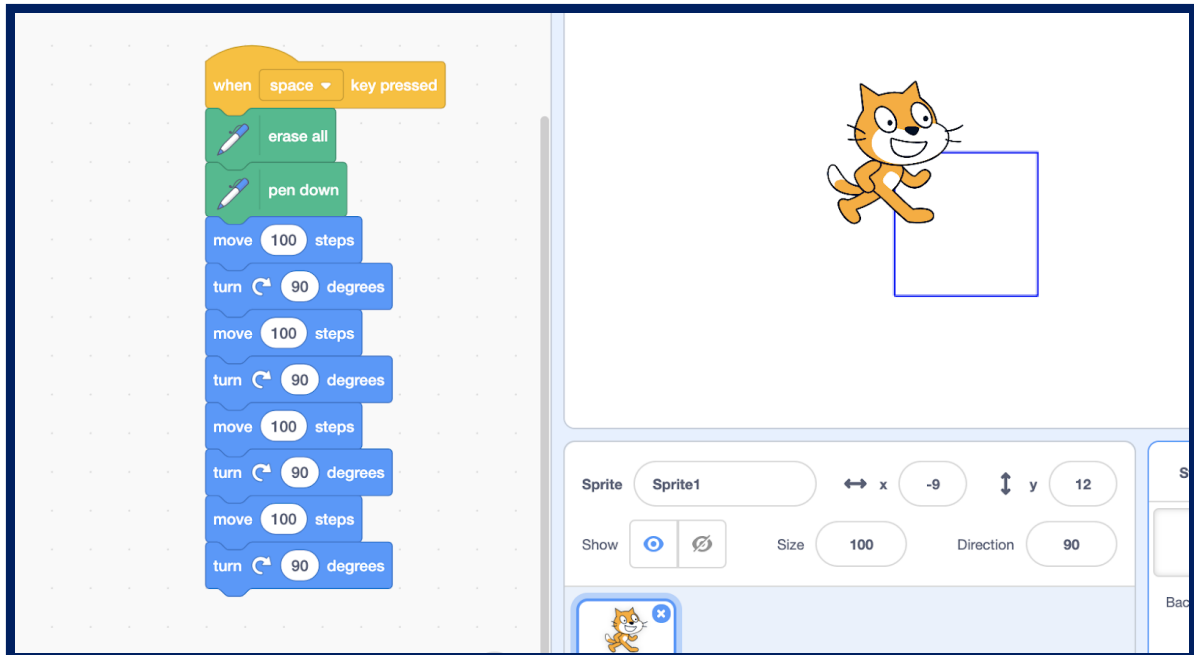
4. Add a wait block to slow down the script.
5. You could get your sprite to hide at the end so that you can see the square

6. Save this project as "Square".

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

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

Under the My Blocks palette select the Make a Block button and call it 'square'
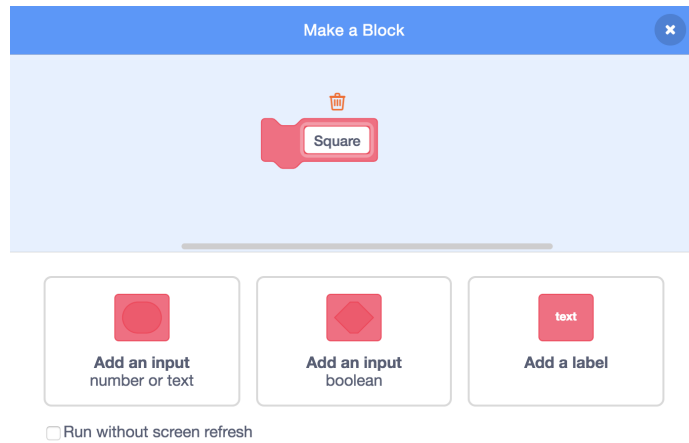
Now you can define square
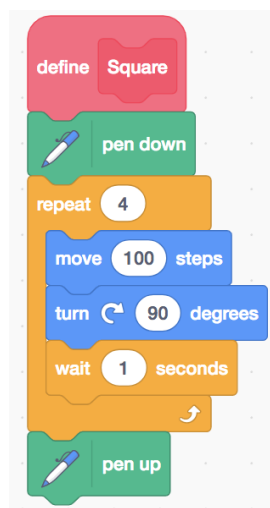
Now any time a sprite uses the new square block it will draw a square. For example if I wanted my sprite to draw 3 squares in a row I could use the following code:

Participant activity

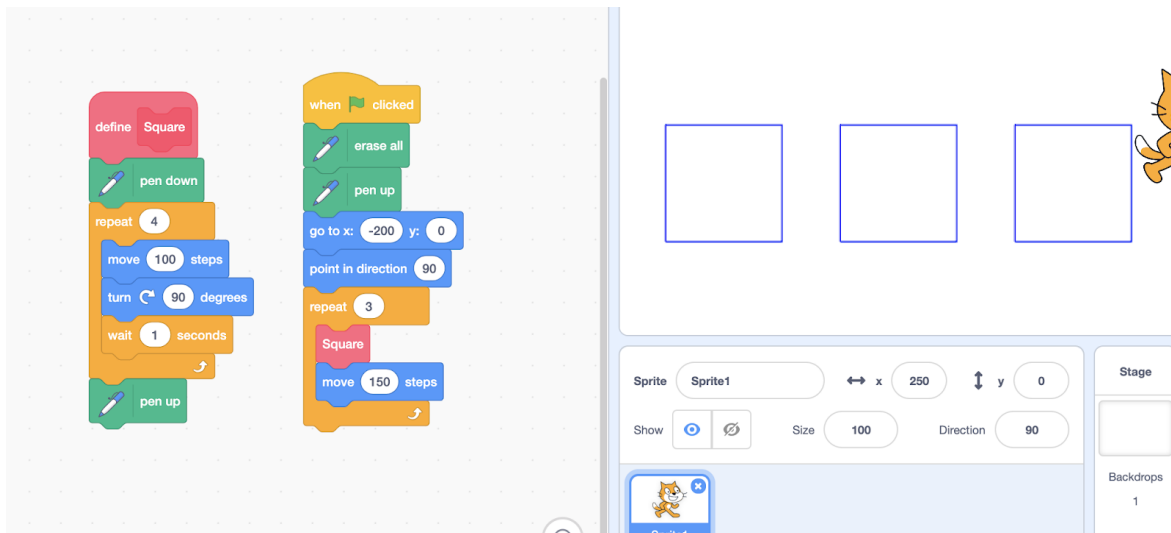Try the code above to create a square block. Experiment by drawing a different colour or pen size. When you have that done see if you can create a block called 'circle', 'triangle', 'pentagon' or 'hexagon'.

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

We now change the square block as follows:

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

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

Participant Activity – Creating modern art

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

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

Participant Activity – Draw a 2D house

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

If time permits you could complete another drawing activity:

Participant Activity – 2D shapes

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

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

Participant Activity – Repetition

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

Discussion Time

Today's objectives were to cover:

Exploring numeracy in Scratch

Problem Solving

Drawing in Scratch

Discussion Time

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