theatr na nÓg

The Butterfly Hunter

Heliwr Pili Pala

technocamps

Inspiring | Creative | Fun
Ysbrydoledig | Creadigol | Hwyl

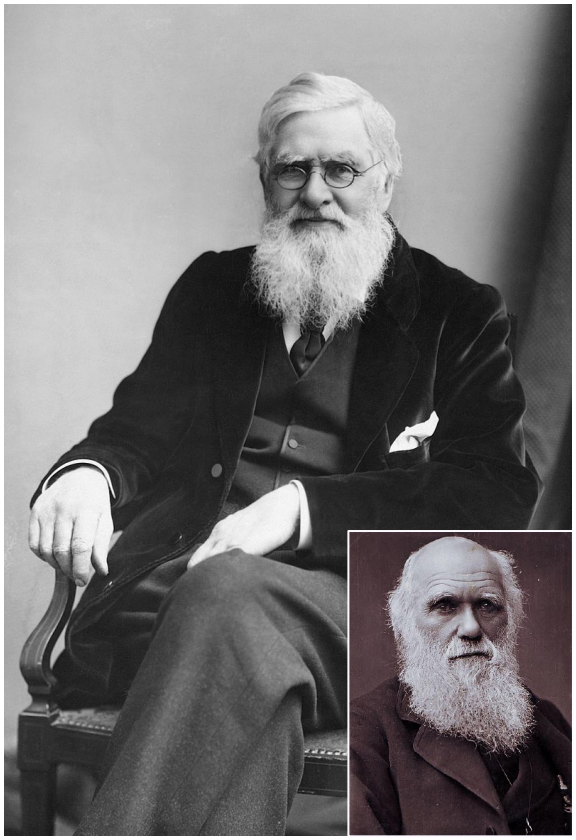
Alfred Russel Wallace: What Do You Know?

Alfred Russel Wallace

Born: 8 January 1823, Usk, Wales

Known For: Being a British naturalist and explorer. He carried out extensive fieldwork during his career, first in the Amazon, then in the Malay Archipelago. Wallace is most famous for developing a theory of evolution by natural selection at the same time as Charles Darwin did.

Died: 7 November 1913, Broadstone, Dorset.



Alfred Russel Wallace and Charles Darwin (inset)

Categorising Insects/Machine Learning

Activity: What is Machine Learning?

Machine Learning

Machine Learning is a system with the ability to automatically learn and improve from experience without being explicitly programmed.

Machine Learning focuses on the development of computer programs that are provided with data and use it to learn by themselves.

Activity: Do You Know Any ML systems?

Current Machine Learning Systems
Siri

- Siri is a voice-activated assistant.
- Siri listens to your instructions, and, when possible, carries them out.
- Siri can open apps, play your favourite music and can even tell you a joke.

Current Machine Learning Systems Security Cameras

- It is not possible for humans to keep monitoring hundreds/thousands of monitors at the same time, using technologies like:
- **object recognition** and **facial recognition**, this becomes possible.

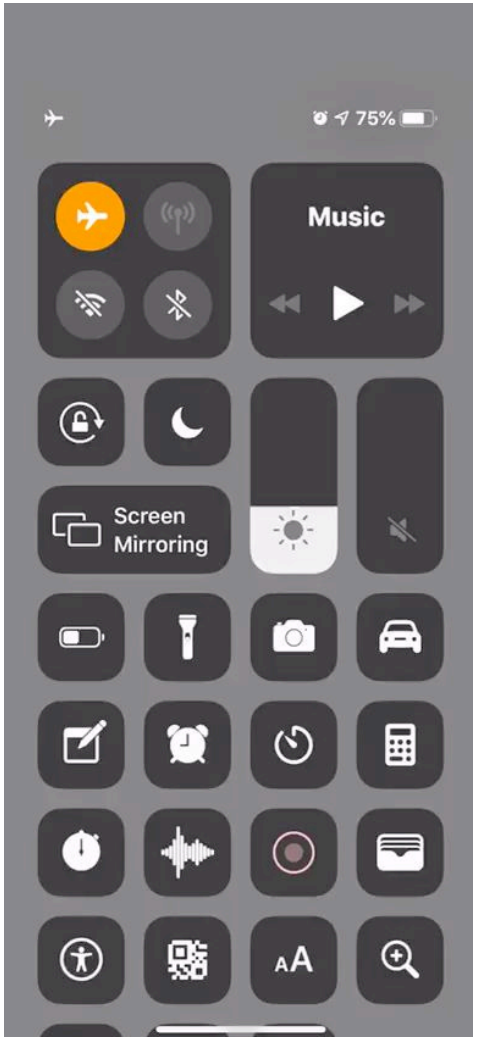
Current Machine Learning Apps / Games

Draw It - mobile app.

Players competes with each other in a online real time drawing game.

The goal is to draw one of the two categories given, so that the computer can make an accurate guess.

The computer is taught through ML to recognise drawings.

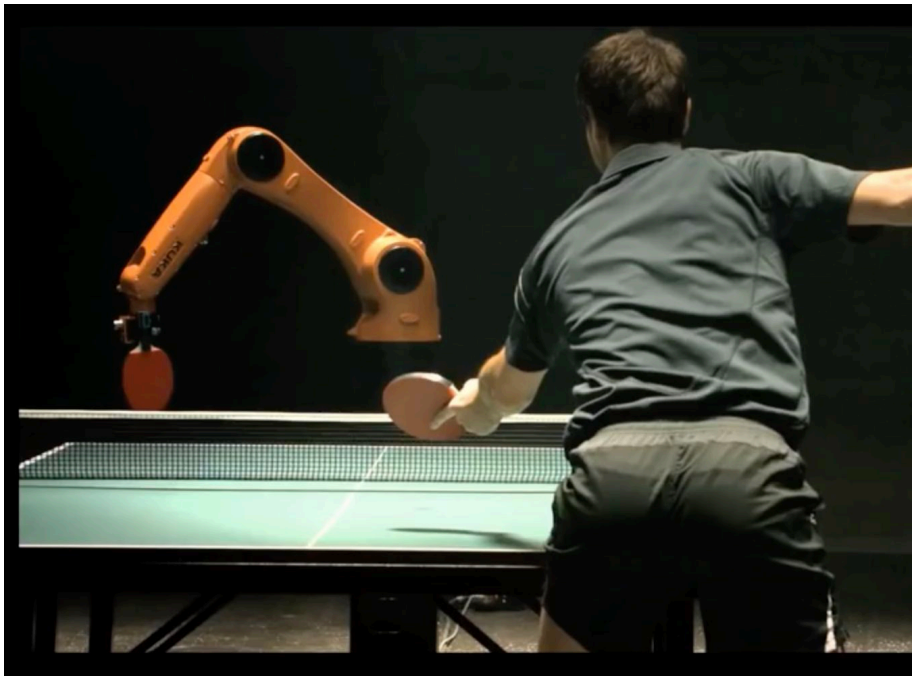


Click to play video.

Current Machine Learning Systems
KUKA

KUKA is one of the world's leading suppliers of robotics.

Table tennis bot



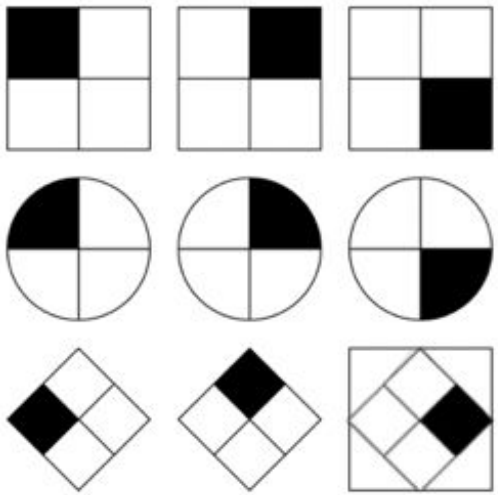
KUKA

Click to play video.

Activity: How Does ML Work?

Answer: Pattern Recognition

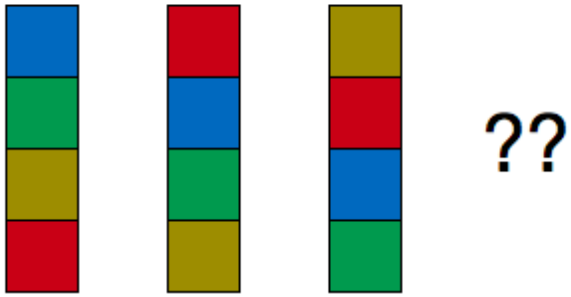
Pattern recognition is the ability to recognise patterns in data sets.

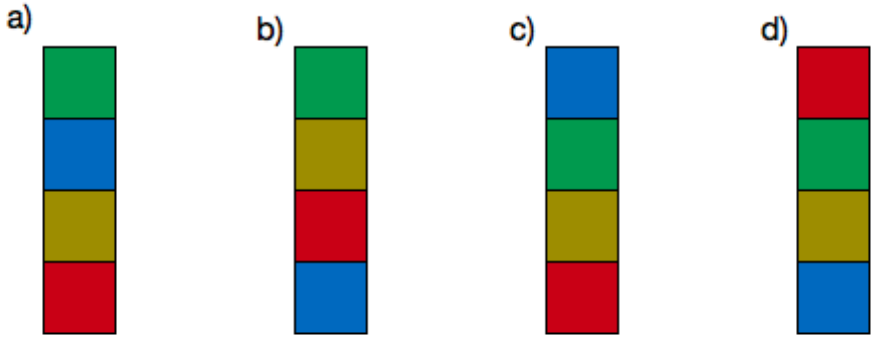


Computers can learn from patterns, for example a computer can learn the difference between photos, such as the shapes and the colour used.

Activity: Pattern Recognition (1)

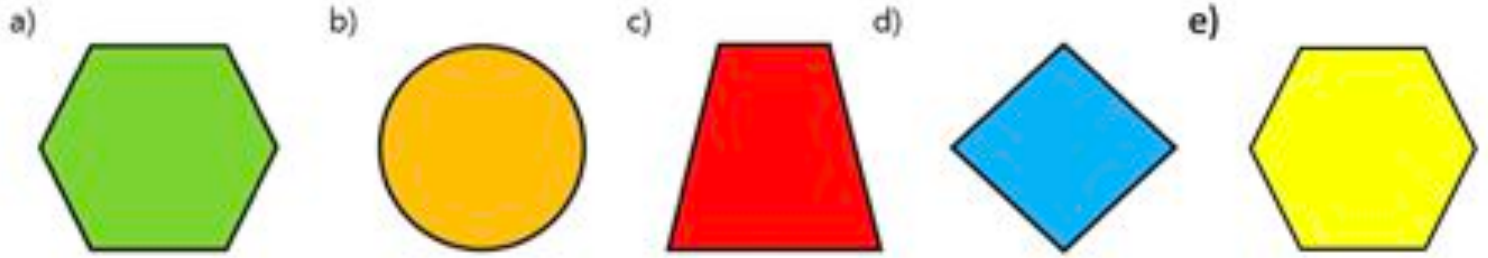
What comes next?





Activity: Pattern Recognition (2)

What comes next?



Activity: ML Simulation, Turtle or Tortoise

Machine Learning in Scratch

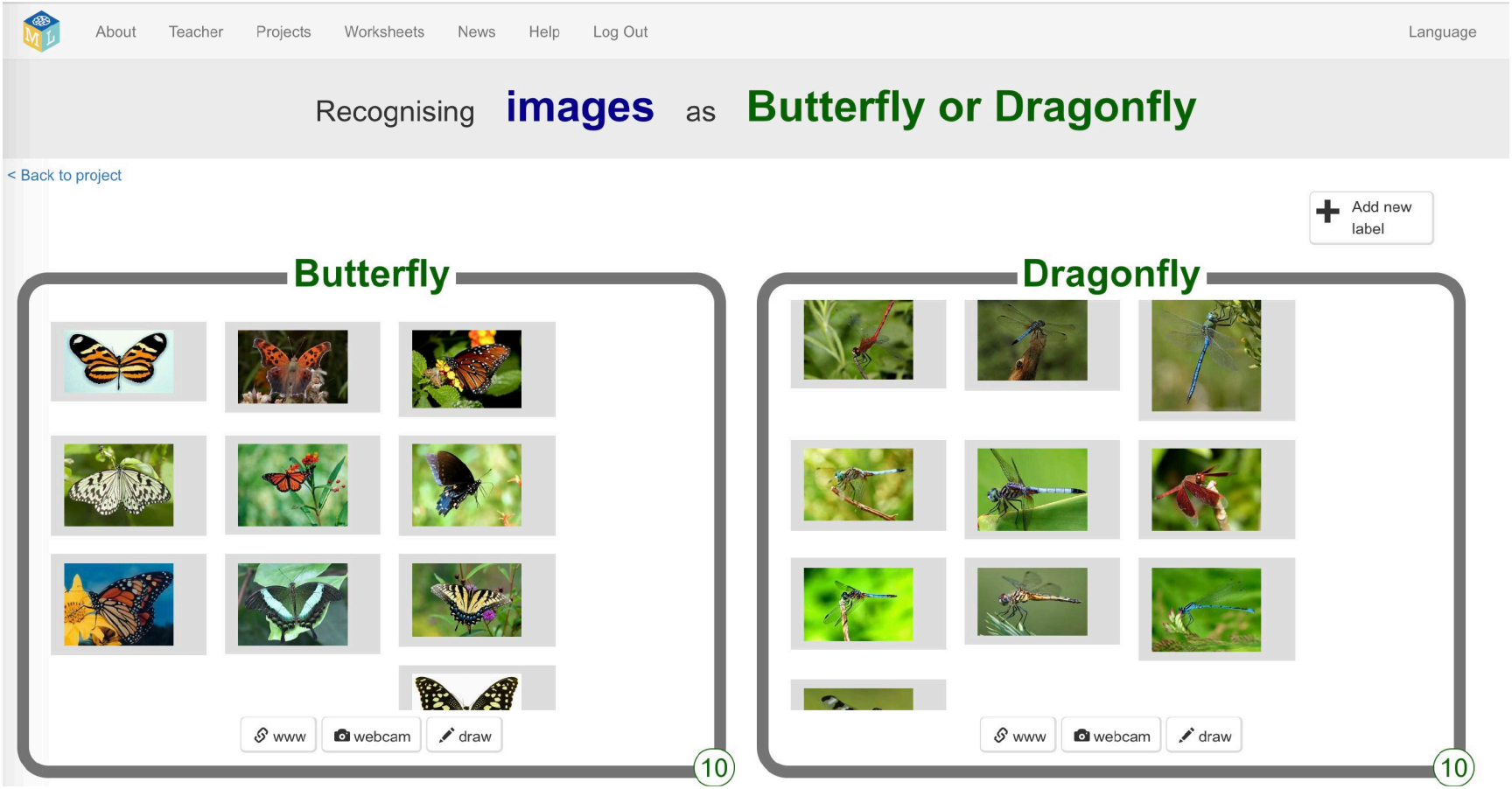
Machine Learning Process

Let us say, we want to be able to train a computer to sort a set of photos into two piles: one pile of photos of butterflies, and one pile of photos of dragonflies.

How would we start this process?

What do we need?

The Training Data

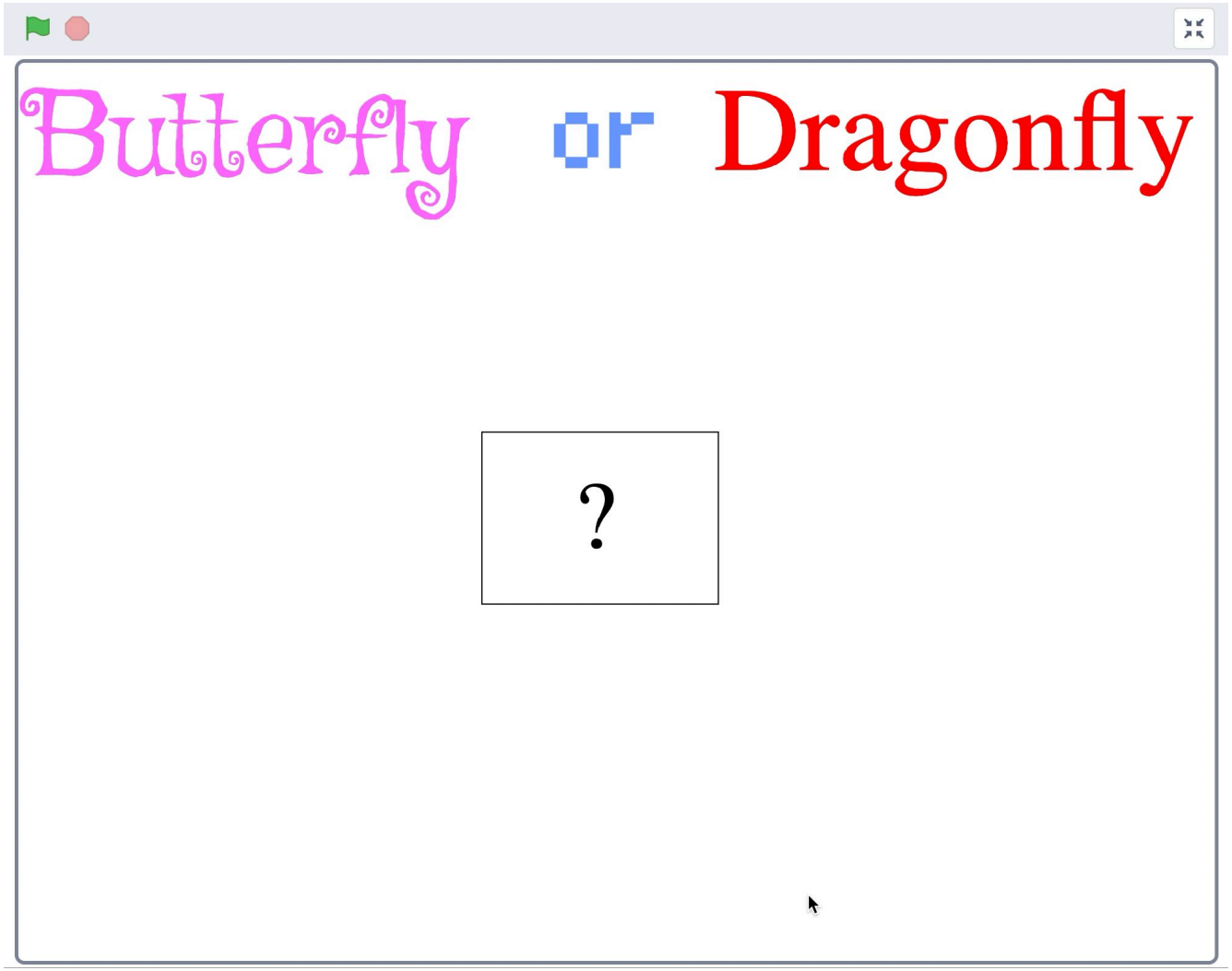


The Code / Algorithm

The code is simple, if the image under observation contains features similar to the images in the 'Butterfly' bucket, then we will place the image under observation on the left. If not, to the right.

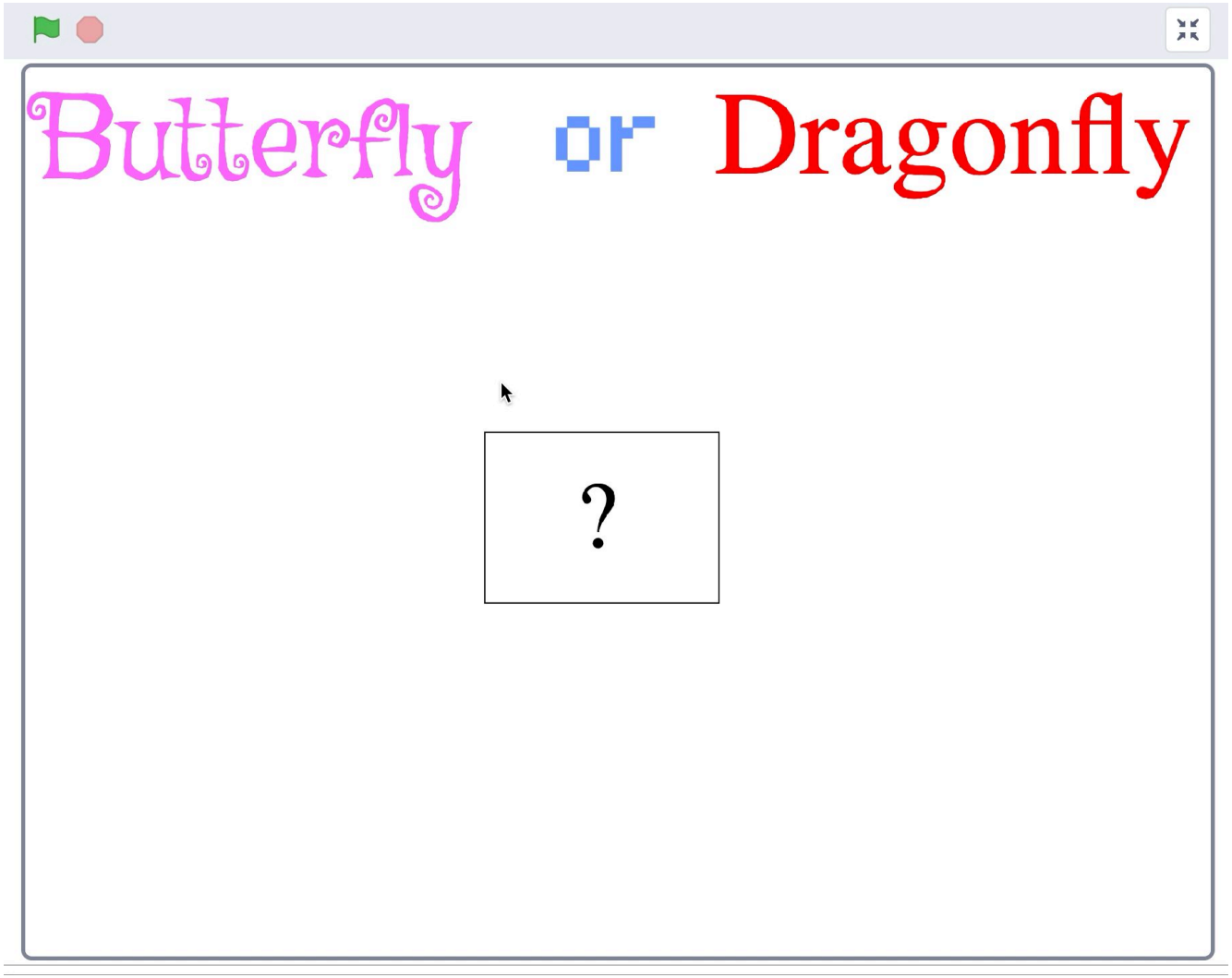
Without ML

Click to play video.



With ML

Click to play video.



Activity: ML Quiz Time!

Activity: Quiz Question 1

Which of these would probably be best for training a computer to recognise a photo of an apple?

a) Photos of dogs.

b) Varied photos of different types of apples in different places.

c) Identical photos of an apple.

d) Very, very similar photos of the same apple in the same place.

Activity: Quiz Question 2

A machine learning system trained to recognise pictures with a tree in should be good at which of the following tasks:

a) Identifying pictures of fruit.

b) Recognising the emotion in a piece of writing.

c) Recognising pictures of trees.

Activity: Quiz Question 3

Alice and Bob both want to train a machine learning system to recognise if text is happy/positive or sad/negative. Which of them will probably train the best system?

a) Alice. She has collected 10 varied examples of happy text, and 10 varied examples of sad text.

b) Bob. He has collected 1000 examples of happy writing and 10 examples of sad writing.

Activity: Quiz Question 4

Without machine learning, it would be impossible for search engines such as Google to exist.

a) True

b) False

Why Are We Different?

Why Am I Not A Butterfly?

Why are we different to other animals and plants?

Why are we different to other people?

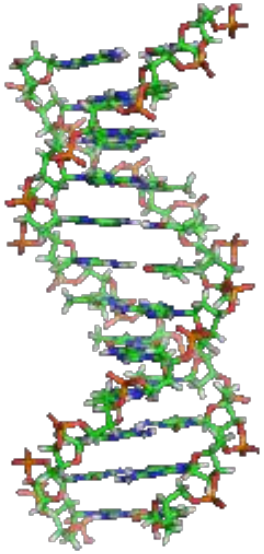
Are we ALL different from one another?

DNA (Deoxyribonucleic acid) – What Is It?

What is DNA?

DNA is like tiny chains that have been twisted like a spiral staircase.

Inside our bodies the chains get tangled up and squashed into very small spaces.



What If We Could Untangle The Chains Of DNA?

How long do you think the chain would be?

Longer than your arm?

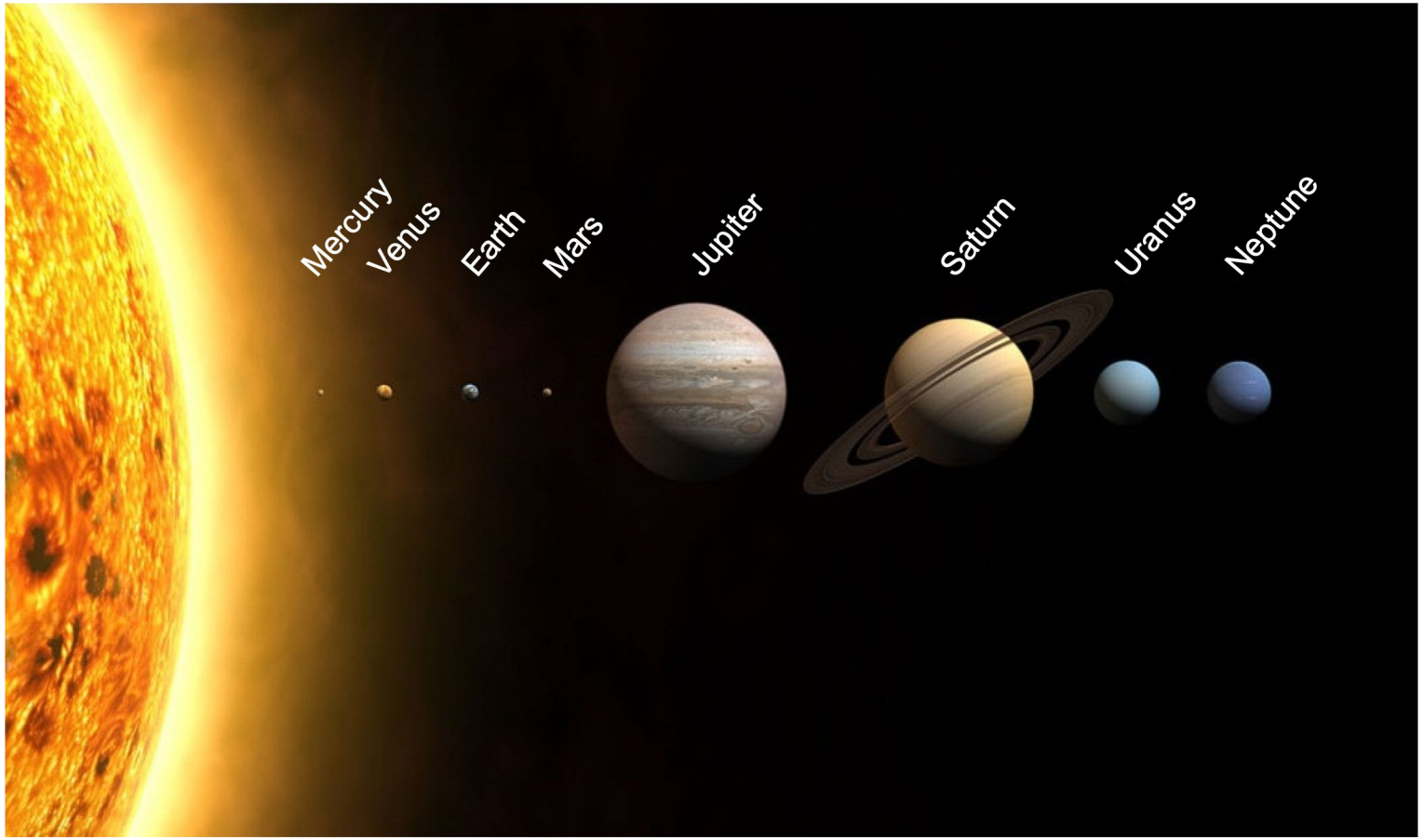
Longer than the school yard?

Longer than from here to London?

Halfway around the Earth?

It Would Stretch Further Than Twice the Size Of The Solar System!

It would stretch around the Earth 1,500,000 times!



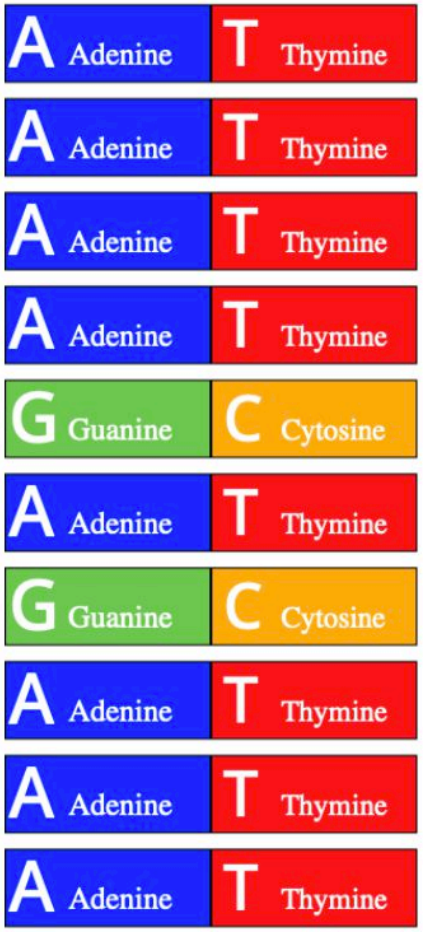
Activity: How Does DNA Make Us Different?

As a group put 14 of the DNA bases in **any** order.

DNA Lottery

DNA Generator

Put your DNA in a different order and see if your order matches the one the computer generates!



Different Living Things Have Different DNA

But some of our DNA is the same as other living things. With the living things below you share around:

99.6% of your DNA

Ed Sheeran

96% of your DNA

A Chimpanzee

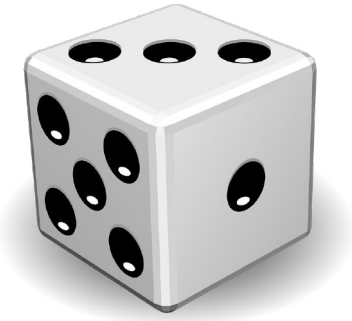
60% of your DNA

A Banana

What Does Random Mean?

If I throw a coin, am I able to know 100% which way it will fall, heads or tails?

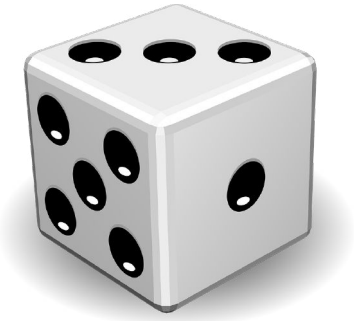
If I roll a 6 sided die, do I know what number it will be?



What Are the Chances?

What is the chance of it landing on heads?

What is the chance of it landing on number 6?



What is the chance of it landing on an even number?

Activity: What Are The Chances?

We're going to throw a coin 10 times and make a tally chart of how often it lands on heads and how often it lands on tails.

	Tally
Heads	
Tails	

We're going to roll a die and make a tally chart to record how often each number appears.

	Tally
1	
2	
3	
4	
5	
6	

So what are the chances of a coin landing on heads and a rolling a number 6 on a die?

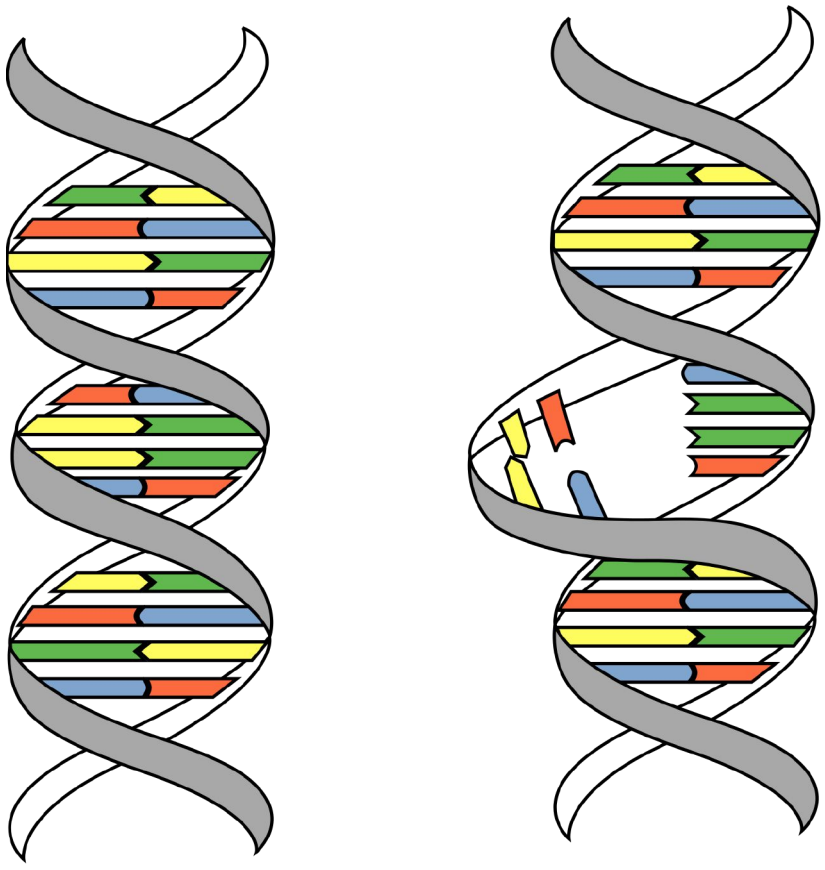
The Order of DNA Changes Things

When living things begin growing, usually around half of their DNA will come from the Mother, and half from the Father.

However, there is a chance that the DNA will be different as mistakes could be made.

This is called a Mutation.

They make us slightly different to our parents.



Adaptations

Some changes in DNA can benefit animals, and over millions of years, this has led to animals adapting to where they live.

A polar bear has adapted to have thick fur, while an African elephant has huge ears that it can flap.

Can anyone think why?

Adaptations in Butterflies

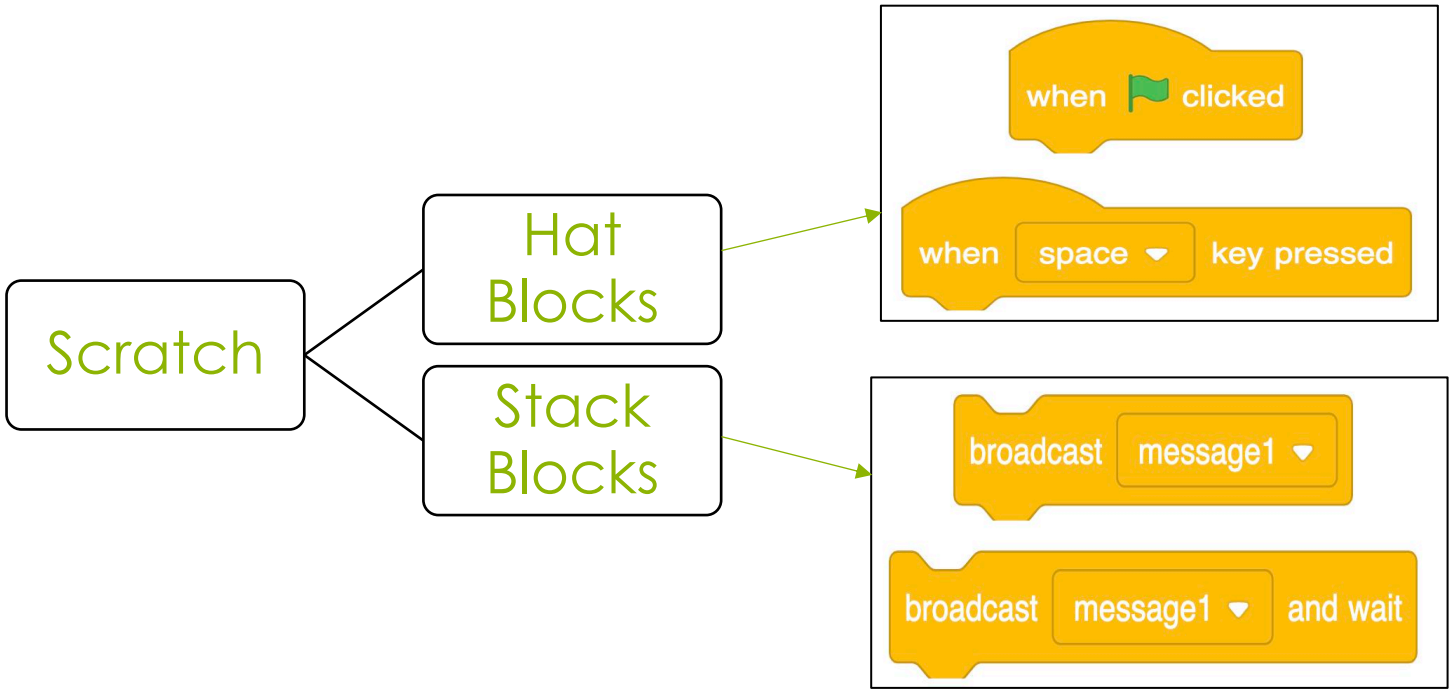
Butterfly Camouflage

technocamps

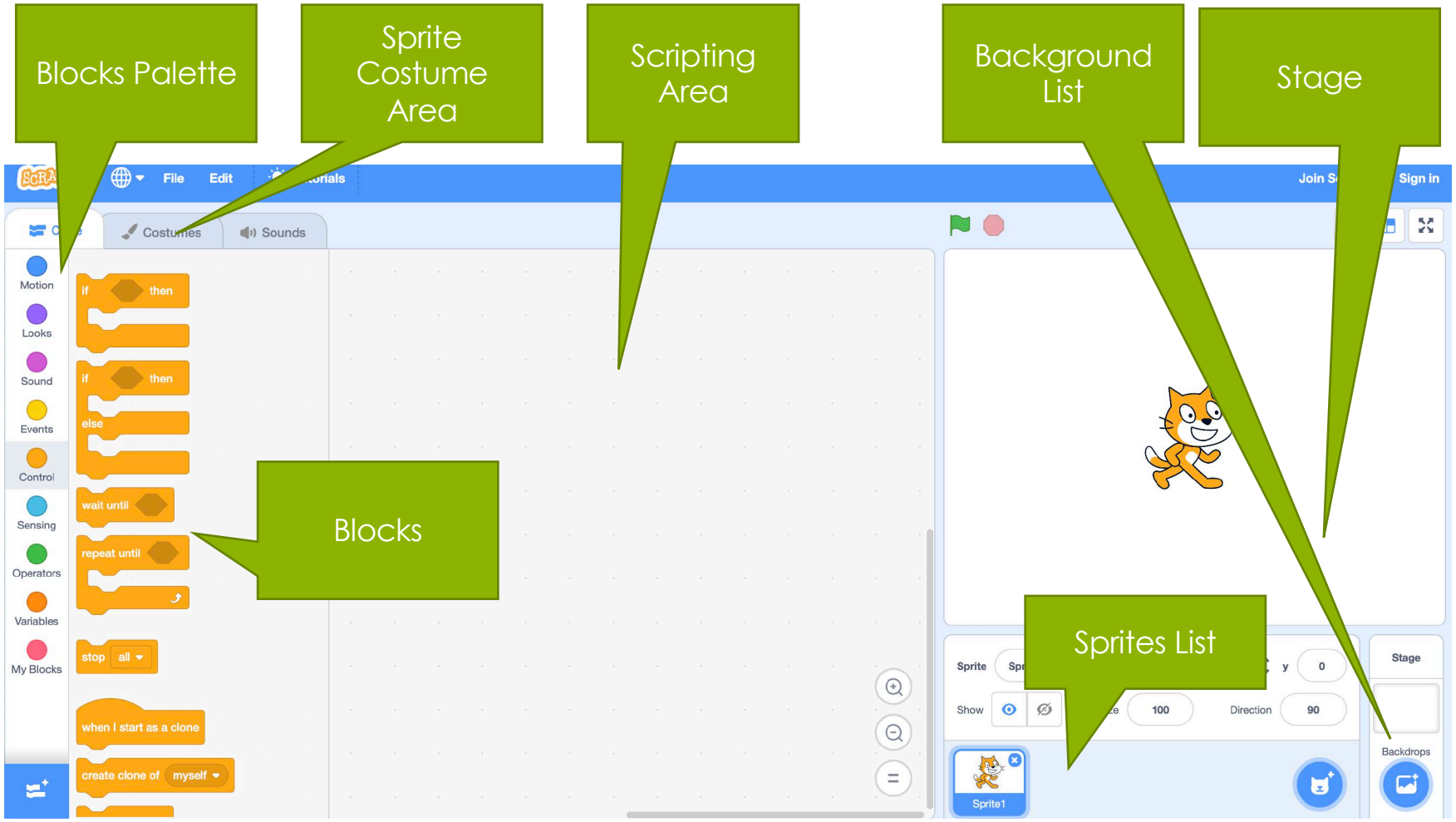
Programming in Scratch

Scratch

- Drag and drop blocks to give instructions
- Easy to create games
- User friendly

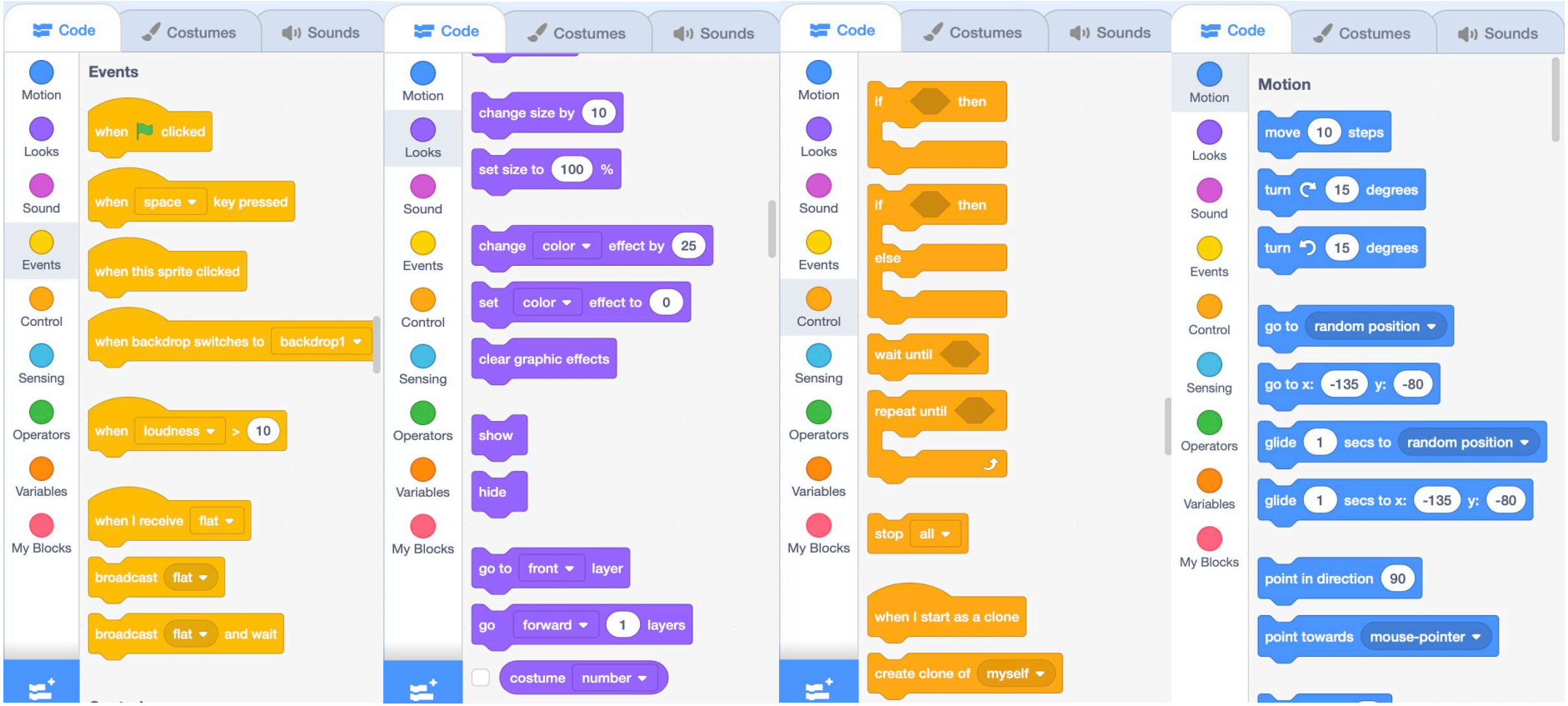


Scratch Basics



Scratch Blocks

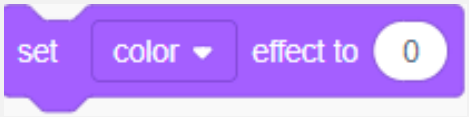
Blocks we would be interested in today are:



Scratch Block Reference

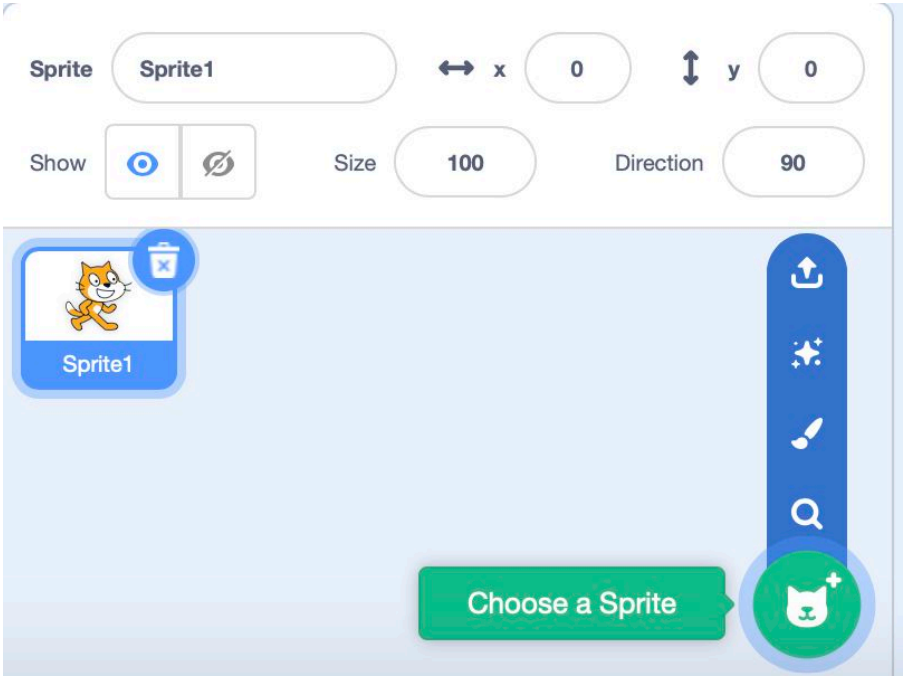
Name	Symbol	Usage
When Green Flag Clicked		Activated once the Green Flag has been clicked
When This Sprite Clicked		Activated once the sprite or clone of the sprite is clicked
When I Receive a Broadcast Message		Invoked once the specified broadcast has been sent by a calling script
Broadcast a Message		Sends a broadcast to the whole Scratch Program

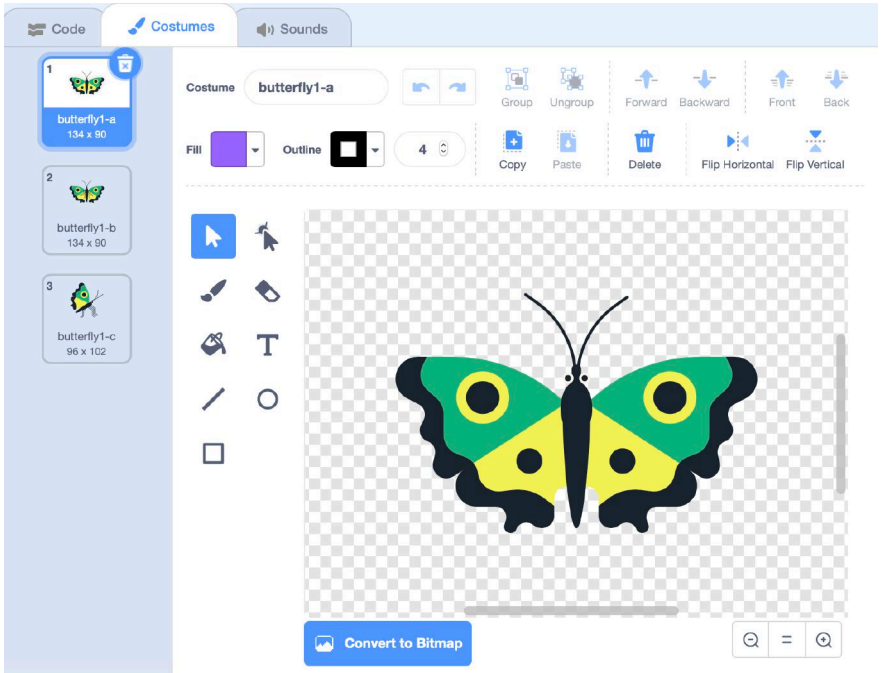
Scratch Block Reference

Name	Symbol	Usage
Show the Sprite		Show the Sprite if it is hidden
Hide the Sprite		Hide the Sprite if it is not hidden
Stop the Program		Stops all the Sprites in the Scratch Program
Set the Colour of the Sprite		Sets the colour of the Sprite to the given colour

Designing A Butterfly

Select a new sprite, find the butterfly and edit the colours by clicking on Costumes in the top left corner.

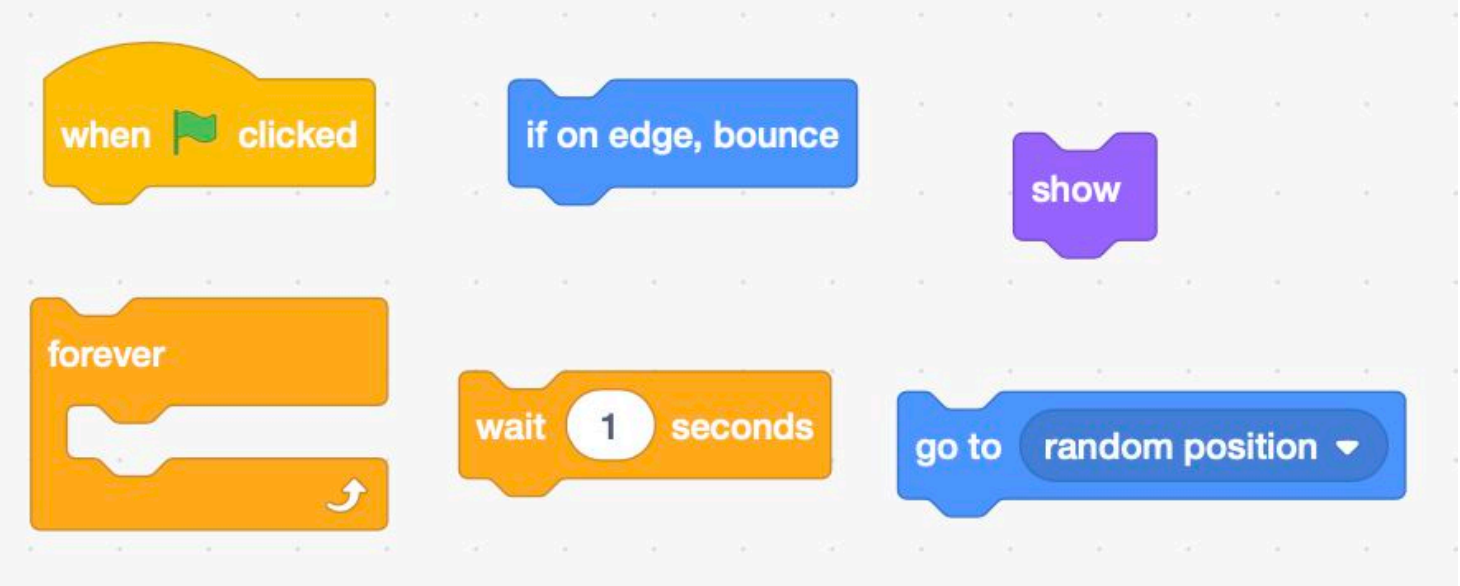




Butterfly Movement

When we click the Green Flag, we want the butterfly to:

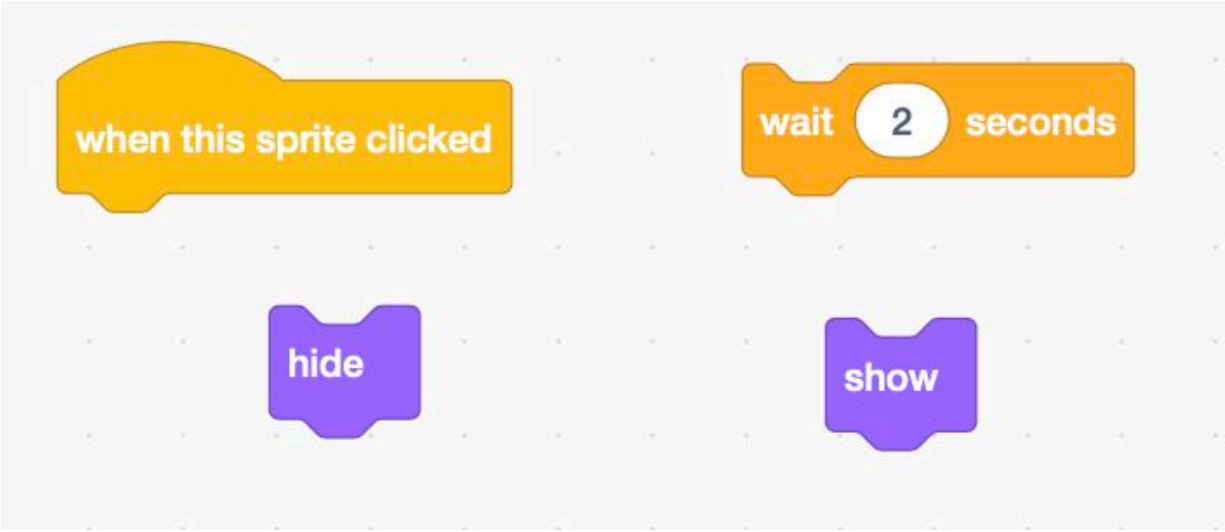
- show in a random place (and if touching the edge it bounces)
- wait some time before moving to a new position.
- repeat this forever



Butterfly Clicking

We want the butterfly to react when it is clicked by:

- hiding
- waiting for some time
- showing again



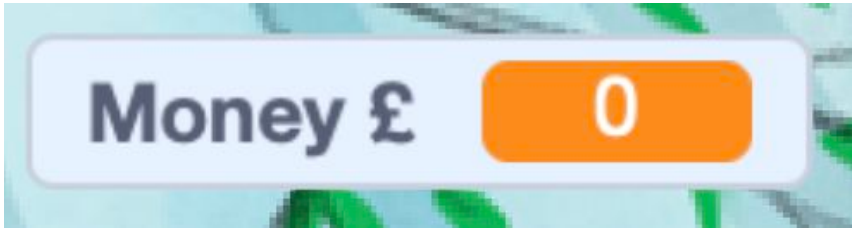
How Can We Improve the Game?

Do you have any suggestions about how we can make the game more fun or interesting?

Adding a Score System

Wallace used to sell the butterflies he caught for money in order to pay for his trips.

So we can add a **variable** to our game to make it add money each time we catch a butterfly.

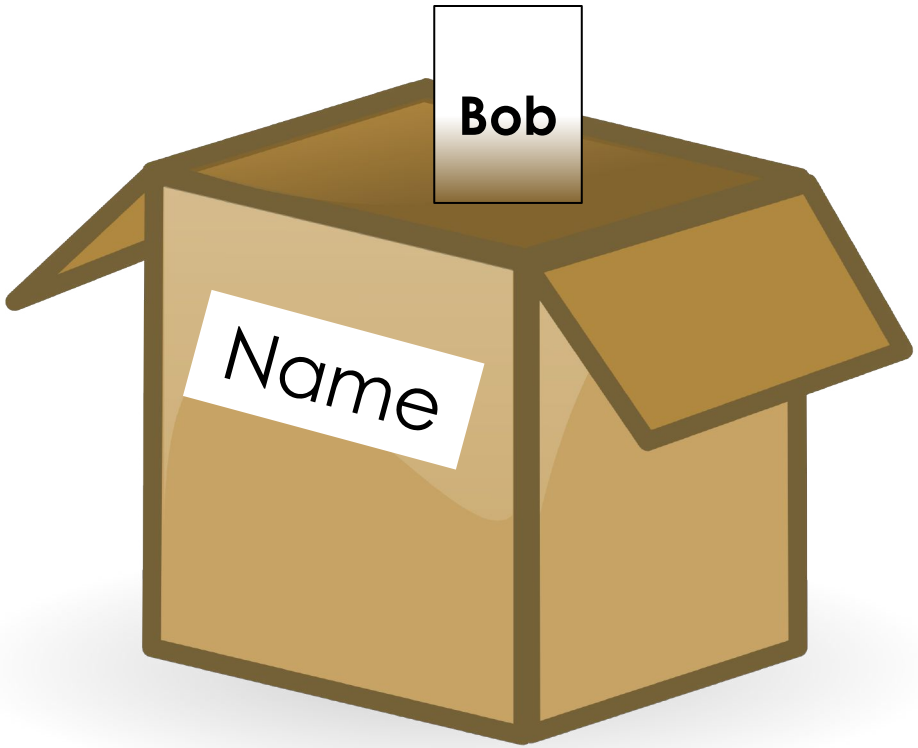


What Is a Variable?

A **variable** is something that stores data in our program. It is like a box with a label on it.

I can store different things in the box, but the label stays the same.

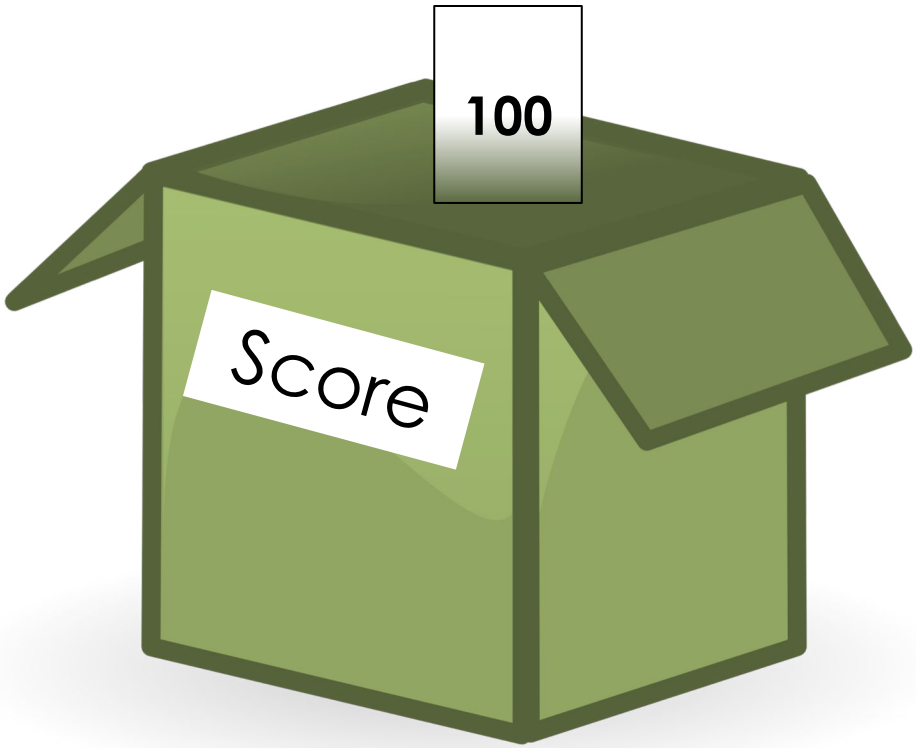
For example, I have stored the word "Bob" in my **variable** which is labelled "Name".



Score Variable

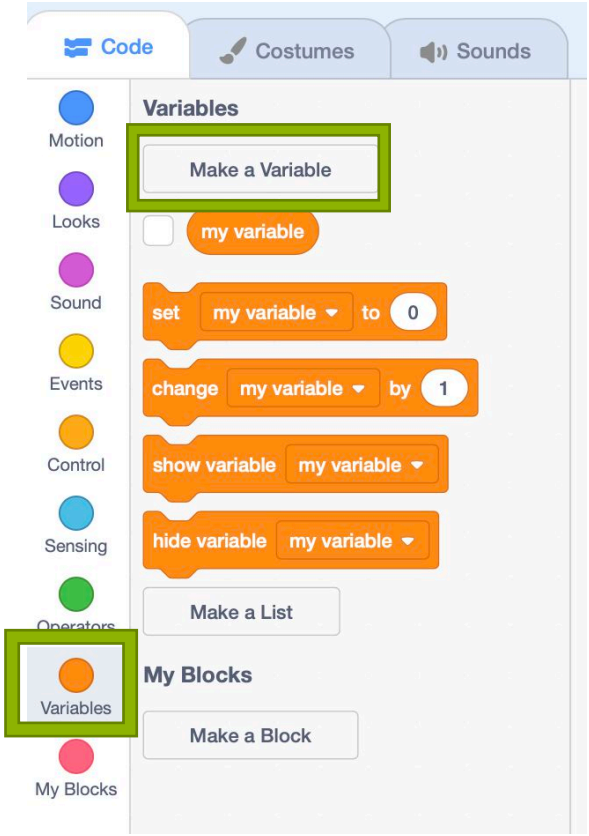
I could have another **variable** named Score which keeps track of our score in a game.

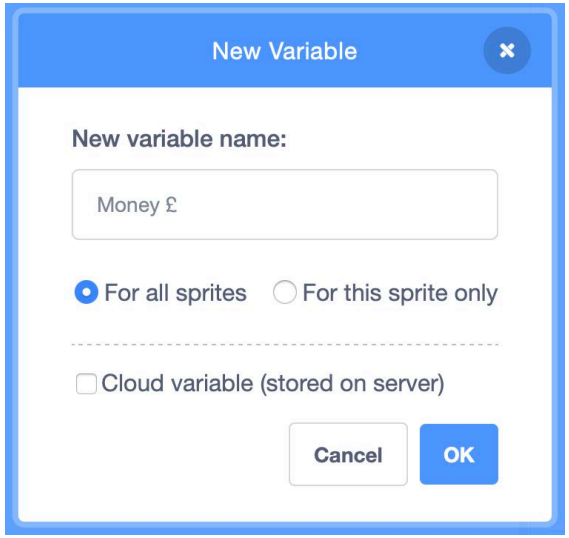
If we're good at the game, our score will go up and will change as we play.

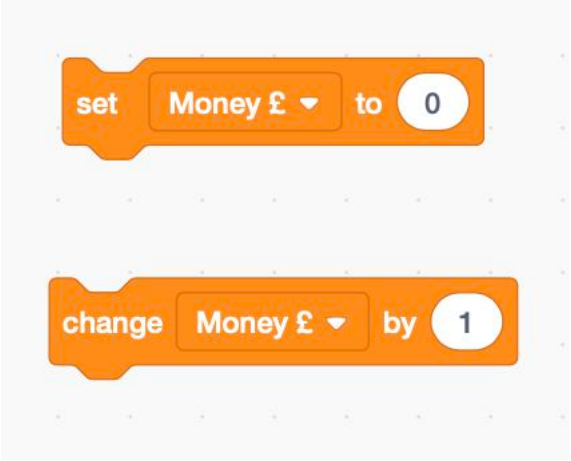


Adding a Variable in Scratch

To add a **Variable**:



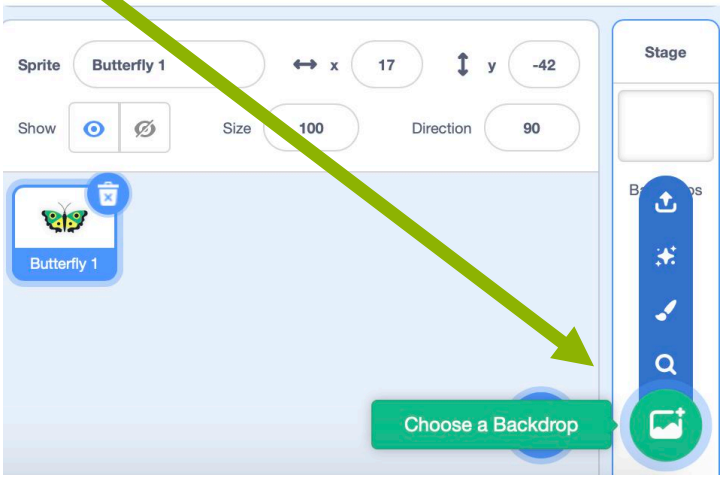




Adding a Background

In order to add a background:

Click on the button in the bottom right corner and choose a background for your game.

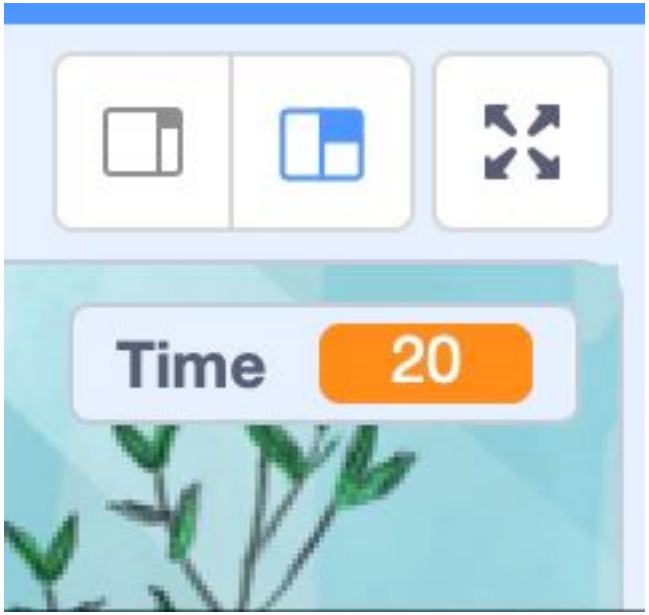


Adding a Time Limit

To make our game more challenging we can add a time limit.

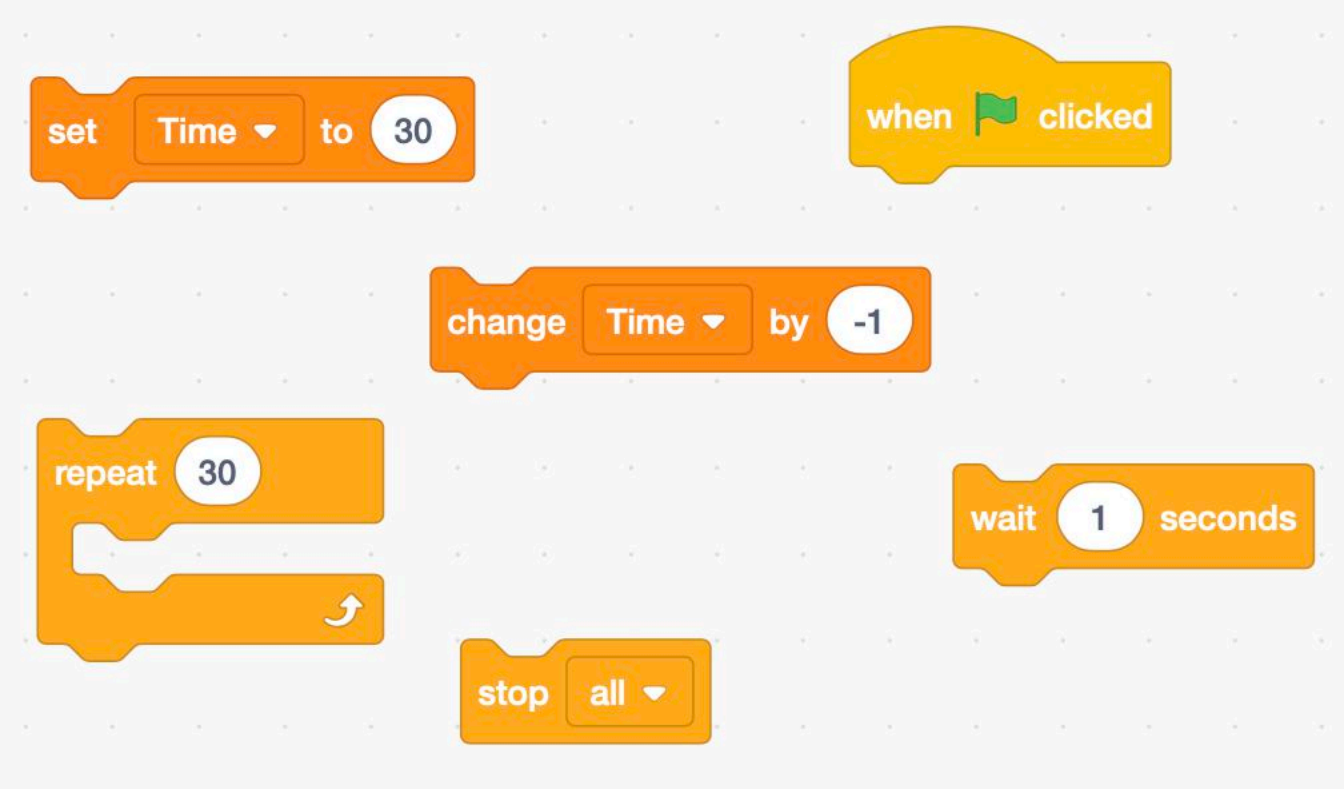
Just like adding our Money **variable**, we need to add a Time **Variable** to our game.

Can you remember how to add a **variable**?



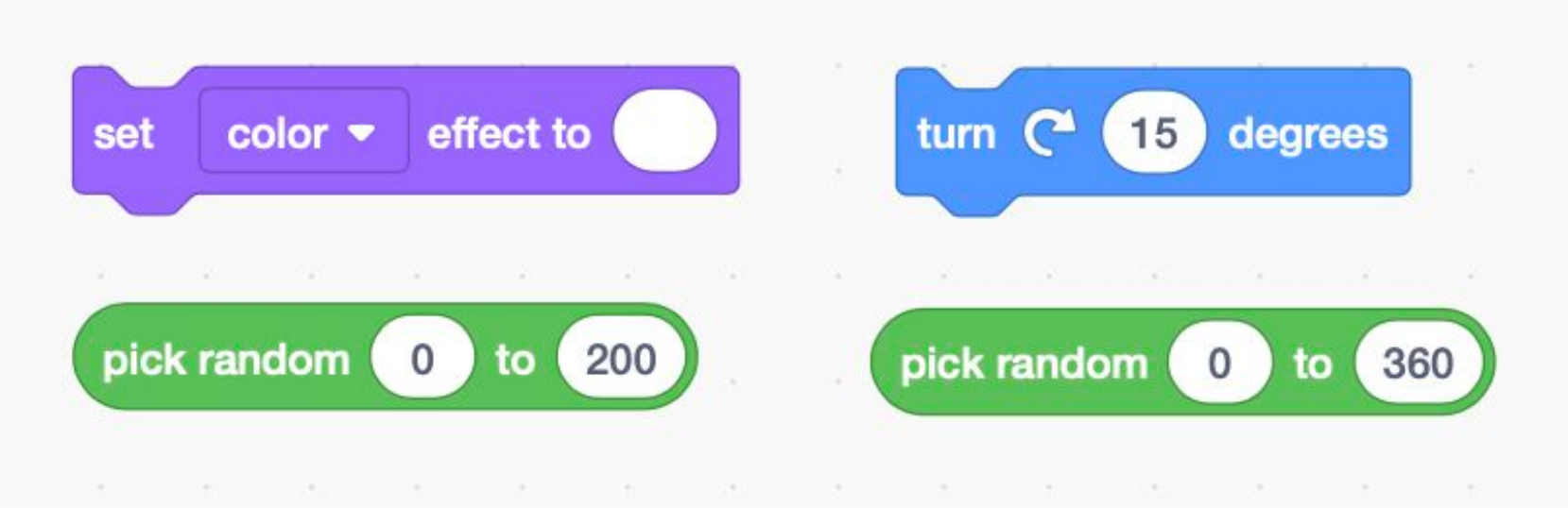
Creating a Timer

Use the following blocks to create a countdown timer:



Changing Butterfly Colours and Direction

We can change the Butterfly's colours everytime we've caught one using the following blocks:



Can you see how they fit together? Where would they go in the code?

Ideas for Extensions

Add a second Butterfly or insect which is harder to catch but gets you more money if you do

Make a swiping noise when you catch a Butterfly

Adding a High Score **variable** to keep track of your best score.

Having a different background for when the game is finished.

Adding a message that says “Time’s Up” at the end.