Programming Essentials In Scratch Part 1

Year 9 Term 3

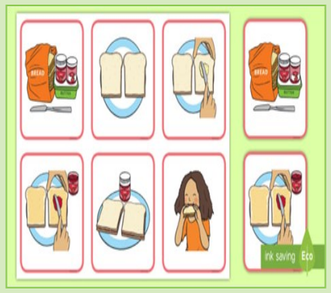
Trinity MAT

Algorithms

Algorithms

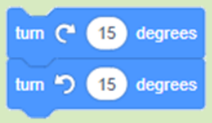
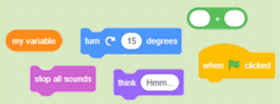
- An **algorithm** is a **sequence** of step-by-step **instructions** to solve a problem.
- Algorithms can be written in code, or be a **sequence** of pictures

A computer algorithm



Algorithm for making a sandwich

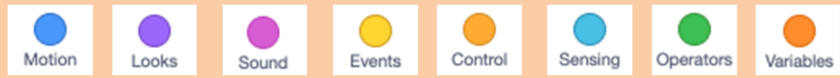
Scratch

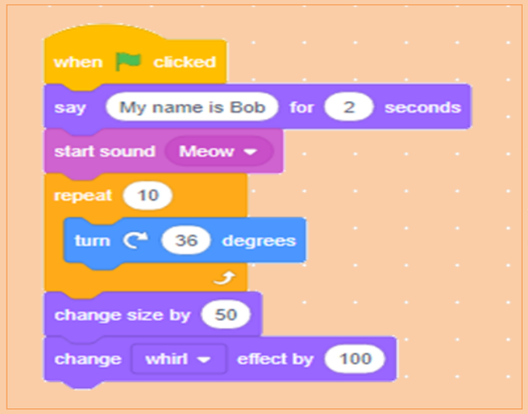
Word	Definition	Image
Sprite	The name of a **character** in Scratch.	
Scratch	The name of the **programming language** we are learning.	
Turn # # degrees	How far to the left or right you want to move your sprite. # is replaced with the number.	
Block	A single instruction in our algorithm.	

Key Terms

Instructions	Detailed information about how something should be done or operated.
Execute	When you create a program for a computer, you give it a set of commands to execute.
Sequence	The order the instructions need to be in.
Selection	Making choices.
Iteration	Doing the same thing more than once **Iteration in computing is the process of repeatedly executing instructions.**
Repeat	The block that makes and instruction happen more than once.
Variables	**A variable is a name that refers to data being stored by the computer.**
Subroutines	In computer **programming**, a **subroutine** is a sequence of program instructions that performs a specific task,
If block	Allows us to check a **condition** and perform an operation if the condition **evaluates** to 'true'.
Debugging	Finding errors in our code.
Abstraction	Taking away all the information that isn't needed.
Decomposition	Breaking down a problem.
Count-controlled	Count-controlled iteration will execute the commands a set number of times.
Condition-controlled	Condition-controlled will execute the commands until the condition you set is no longer being met.

Scratch blocks and programme examples





We can use **algorithmic prediction** to guess what will happen. My **Sprite** is going to get bigger!

The **repeat loop** in this example, will move ten times. This is **more efficient** than writing out ten **commands.**

The **turn # degrees block** will turn my sprite. This **algorithm** will turn my **sprite** in a circle.

Representations from Clay to Silicon

Year 9 Term 3

Trinity MAT

Key Terms

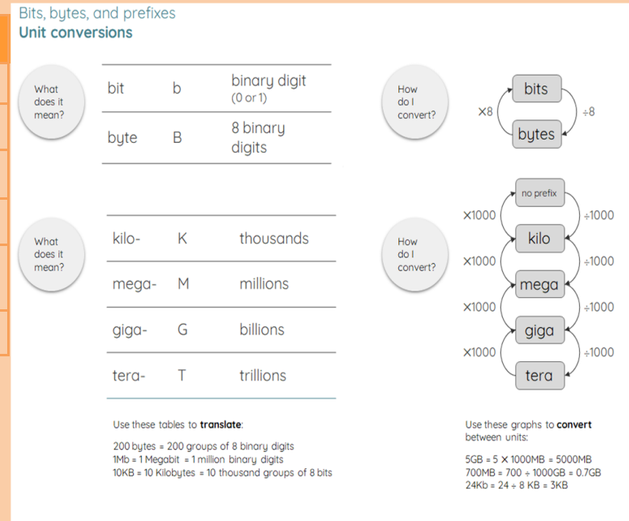
Representations	Computers use sequences of symbols to represent information.
Symbols	Sequences of symbols can represent any piece of information.
Storage Communication Process	Computers need to **store**, **process,** and **communicate** information.
Byte	A **group of eight binary digits** is called a **byte.**
Binary Digit	**All pieces of information** are represented as sequences of binary digits.
Binary	Numbering system which uses base 2 (0s & 1s) – the only language that computers truly understand. 0 means off, 1 means on.
Denary	Numbering system which uses base 10 (0□9) – these are our normal numbers that we use every day. (Otherwise known as decimal)
Hexadecimal	Numbering system which uses base 16 (0□9 and A□F). These numbers are used to represent colours and code in assembly language, as they are easier for humans to understand than binary.
Binary addition	Adding binary numbers together (see rules of binary addition).
Overflow	If you cannot represent a number in the given amount of space.
Binary Shift	Moving bits within a binary number in a certain direction. Any empty positions are filled with 0.
Check digit	An additional digit at the end of a string of numbers used to check for mistakes in transmission. ISBNs are formed of 12 bits for the item number, then the 13th is a check digit..
Character	A single letter, number or symbol. (e.g., A, 1, !)
Character set	A set of characters used in a language, which are each represented using a unique binary number.
ASCII	A character set which uses 7 bits to store a maximum of 128 characters. This uses the binary numbers 0 to 127.
Extended ASCII	The same as ASCII, though uses 8 bits (1 byte) to represent 256 characters using the numbers 0 to 255.
Unicode	The modern standard for representing characters in a computer system. Uses 16 bits to allow 65,536 characters to be represented.

Further Key Terms

Image	A picture that has been created or copied and stored in electronic form.
Bitmap	A map of bits whereby the images is made of pixels.
Vector	An image represented using lines and shapes with specific properties such as line and fill colour.
Pixels	The individual units (dots) that make up an image.
Colour	The number of bits, which are used to represent each pixel in an depth image. Increased numbers of colours means more bits are needed.
Resolution	The level of detail in an image, measured in dots per inch (dpi). If the size of an image is increased then the quality will reduce.
Metadata	Data which is stored about a file. Examples include the type of file, date and time created, file size geo-location.
Sampling	Method of converting an analogue sound signal into a digital file containing binary numbers.
Sample rate	The frequency at which you record the amplitude of a sound. Measured in Hertz.
Sample resolution	The number of bits used to store each sample. Sample size The number of seconds over which the sample was taken.
Compression	**Compression** is the method **computers** use to make files smaller by reducing the number of bits (1's and 0's) used to store the information.
Lossless	Organises data to reduce the size of a file without removing any information (eg. ZIP).

Unit Conversation

Name	Equal To
Bit	1 bit
Byte	8 bit
Kilobyte	1,000 byte
Megabyte	1,000 kilobyte
Gigabyte	1,000 mega-byte
Terabyte	1,000 gigabyte



Encode/Transmit/Decode Messages

a	1100001	n	1101110
b	1100010	o	1101110
c	1100011	p	1110000
d	1100100	q	1110001
e	1100101	r	1110010
f	1100110	s	1110011
g	1100111	t	1110100
h	1101000	u	1110101
i	1101001	v	1110110
j	1101010	w	1110111
k	1101011	x	1111000
l	1101100	y	1111001
m	1101101	z	1111010

Message - **Computing**

C - 1100011

O - 1101110

M - 1101101

P - 1110000

U - 1110101

T - 1110100

I - 1101001

N- 1101110

G - 1100111

Binary to Denary

Binary number					Decimal number
16	8	4	2	1	
1	1	0	1	0	
16	8		2		16+8+2 = 26

Denary to Binary

Decimal number	Binary number			
	16	8	4	2	1
13		1	1	0	1
		5	1		0