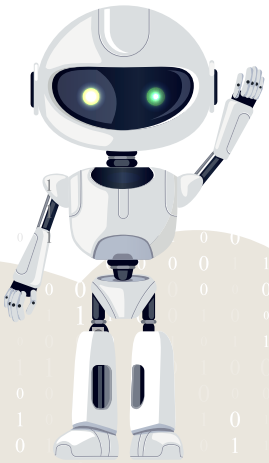
EPIC The Irish Emigration Museum

QUIZZES! PUZZLES! GAMES! AND MORE

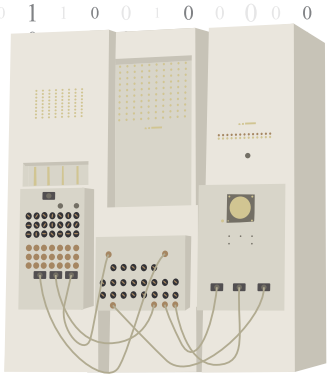


COMPUTER SCIENTISTS

Classroom Pack

Discover Irish computer scientists and how to become a coder!

Learn about Kay McNulty



A HISTORY OF... Computer Science

The history of the computer has as many different parts as a computer itself! To help you understand more about how a computer works, we've outlined some of the key developments below.

Leonardo Da Vinci used 'The Abacus'

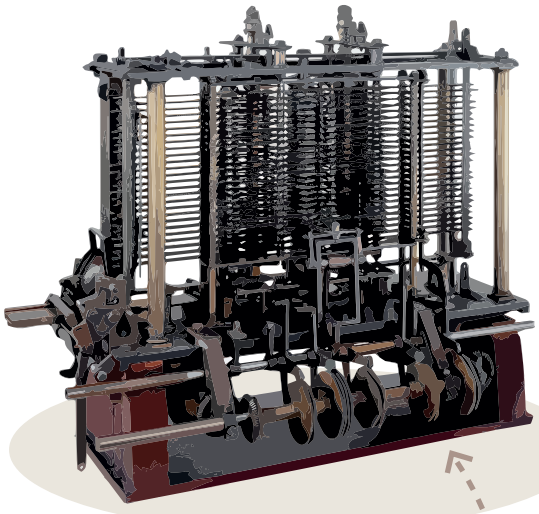
THE ABACUS

Computers are like mathematicians – they need numbers to work. One of the first pieces of computing equipment was an abacus, a system of using items such as stones, beads, gears, punch cards or other materials to add and subtract. Many different societies have used them through the years, from the ancient Mesopotamians in 2700 BC, to Renaissance artists and scientists like Leonardo Da Vinci, to modern day mathematicians.

THE BEGINNING OF COMPUTER SCIENCE

An Englishman called George Boole (1815-1864), who lived in Cork, Ireland, was one of the first men who believed that human thought followed laws, and that these laws were grounded in mathematics. Called 'Boolean' logic, this theory went on to become the basis of how modern computers function!

George Boole, professor of mathematics at Queen's College, Cork



A portion of Charles Babbage's Analytical Engine, considered to be the first computer.

THE FIRST COMPUTER

When computers were first made, they looked very different to how they are now – they were so big in fact that they could take up an entire room! One of the earliest known computers was made in the early 1800s by a man called Charles Babbage. Known by some as 'the father of the computer', Babbage was an English mathematician, philosopher, inventor and mechanical engineer – and all the essential parts of the modern computers can be found in his first design.

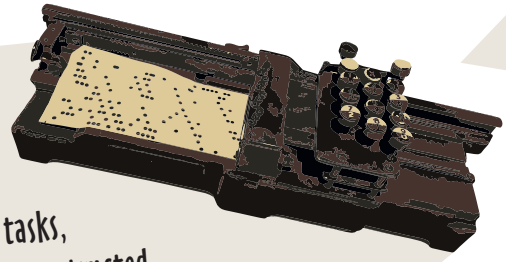
THE FIRST ALGORITHM

An algorithm is a series of step-by-step instructions given to computers to help them complete tasks. The very first algorithm is said to have been designed by a woman called Ada Lovelace. A mathematician and the daughter of Lord Byron, a well-known English poet, in 1843 she published an article about computers, which came to be recognised as the first algorithm. In her notes, she also predicted that one day computers would be able to play music, as well as chess. Needless to say, her predictions came true!

One day computers will be able to play music and chess.

- Ada Lovelace, 1843

EARLY CODE

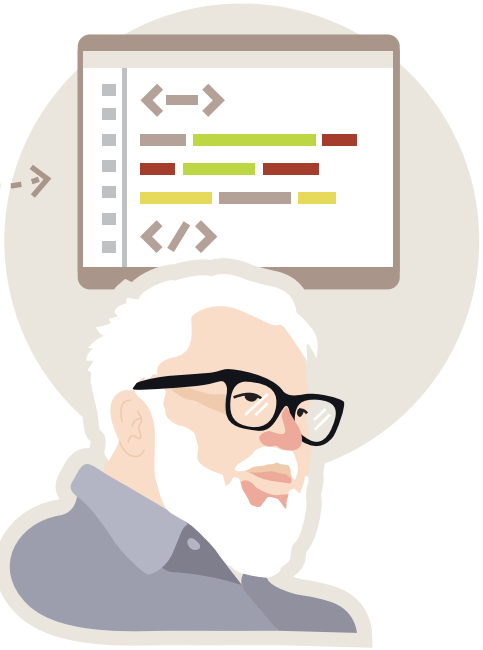


Up until the early 1900s, if a computer had to do multiple tasks, it had to be dismantled and reconstructed before it could understand its new algorithm. That all changed in 1906, when a businessman called Herman Hollerith invented a machine called a 'tabulating machine'. This machine used pieces of card punched with a 'code', which could be easily swapped in and out in order to tell the machine how to approach different tasks.

WHAT IS... ?

So if an 'algorithm' is a whole series of instructions, and 'code' is the instructions themselves, then the 'programming language' is the language that we use to communicate with a computer.

A programming language is made up of lines of code containing instructions



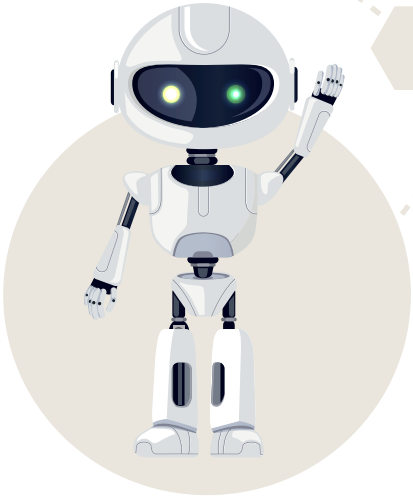
PROGRAMMING LANGUAGES

Although computers were around for a while, programming languages weren't officially invented until the late-1950s. The first computer language was FORTRAN (FORmula TRANslation), developed by John Backus. The second programming language was called LISP (LISt Processor), and was invented by the son of an Irish emigrant called John McCarthy, who lived in America. A mathematician and computer scientist who loved to read and write science-fiction novels, John also coined the term 'artificial intelligence'. While early programming languages could only really do one thing, they have since evolved, and now any one language can be used for almost any purpose!

John McCarthy, Invented LISP in 1958

COMPUTERS TODAY

Did you know, modern computers were only made about 40 years ago? In the 1980s, computers began to get smaller and cheaper, which meant that they started to appear in households, becoming known as 'personal computers' or PCs. Of course, they haven't stopped there – now you can hold a computer in the palm of your hand as a smartphone, or on your wrist, in a watch!



There have also been many other important milestones in the development of contemporary computers: from keyboards to digital technology. We have even invented touchscreens and motion sensors to help us input information – not to mention high-resolution visuals and things such as robots, computer games and augmented reality!

While early computers relied on humans to input algorithms every day, with the advent of digital computers, artificial intelligence and increased computer learning, we can only expect computers to get quicker and smarter in future. Kids just like you are at the forefront of contemporary computer development, with apps such as Scratch and Tynker teaching you how to code quickly and easily, and coding clubs such as CoderDojo springing up all around the world!

SCRATCH

CoderDojo

COMPUTER SCIENCE... word search quiz

Solve the clues below to find the missing words, and then look for your answers in the word search.

1. One of the first pieces of computer equipment, this uses items such as beads to count sums.
2. 'B_ _ _ e _ _' logic is the logic modern computers use to think.
3. Charles _ _ _ _ _ _ _ is known as the 'father of the computer'.
4. A series of step-by-step instructions given to computers to help them complete tasks is called an a _ g _ _ _ _ _ m.
5. Ada _ _ _ _ _ _ _ _ _ , the woman who came up with the first computer algorithm.
6. The machine that Herman Hollerith invented is called a t _ _ u _ _ _ _ ng machine.
7. Instructions or words given to computers are called a c_d_.
8. The name of the first official computer language was _ _ R _ R _ N.
9. Complete the term that John McCarthy coined in relation to computers: _ _ _ _ _ _ _ _ _ _ intelligence.
10. What name beginning with 'p' is given to computers at home?

Q	J	L	Q	G	L	R	Z	L	L	O	U	L	P	Y
V	V	A	J	C	P	G	C	A	U	A	Q	N	E	I
E	G	A	B	B	A	B	I	H	J	P	I	U	R	R
Q	N	R	Z	G	O	C	G	K	Q	I	G	V	S	G
N	G	O	G	T	I	G	F	Z	E	T	U	I	O	S
N	A	Y	N	F	G	L	E	D	P	Y	P	I	N	U
X	W	R	I	A	L	G	O	R	I	T	H	M	A	C
G	Z	T	T	E	T	C	E	V	Z	F	B	X	L	A
A	R	W	A	R	O	Z	R	O	E	O	X	Y	A	B
A	W	A	L	L	O	A	P	B	O	L	I	X	N	A
Q	N	S	U	E	U	F	C	L	B	F	A	S	P	E
O	W	O	B	B	Q	N	E	M	G	Q	D	C	T	F
M	N	C	A	T	M	A	X	A	Z	U	E	V	E	A
T	R	N	T	O	N	N	C	D	E	G	N	O	I	A
W	Z	A	L	N	H	K	K	G	G	B	Y	J	D	B

Answers:
Abacus
Boolean
Babbage
Algorithm
Lovelace
Tabulating
Code
FORTRAN
Artificial
Personal

A FOCUS ON Kay McNulty

NAME
Katherine McNulty Mauchly Antonelli

ALIAS
Kay

DATE OF BIRTH
12th February 1921

PLACE OF BIRTH
Near Muckish Mountain, Co. Donegal

MUSEUM LOCATION
Blazing a Trail Temporary Exhibition

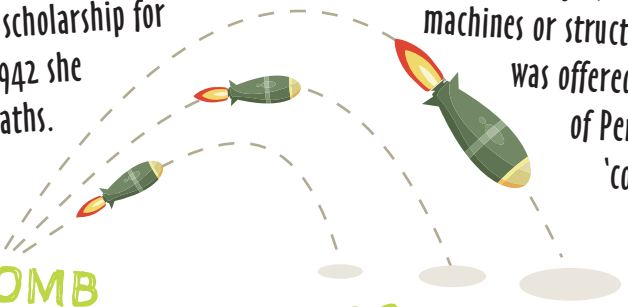
Kay McNulty was born in a Gaeltacht (Irish-speaking) region of Co. Donegal in February 1921, during the Irish War of Independence. Her father was arrested on the night she was born for being involved in the war, and he spent the first two years of her life in prison.

EMIGRATION

In October 1924, the family emigrated to Pennsylvania in America to start afresh. When they first arrived, Kay could only understand Irish, however, she was a hard worker and went on to attend High School, something most Irish girls at the time could only dream of. She won a scholarship for Chestnut Hill College for women and in 1942 she graduated with outstanding grades in maths.

WWII

Kay did not want to be a teacher, a common career at the time for women; instead she wanted a job where she could use her maths skills. She decided to become an engineer – a person who designs, builds and maintains machines or structures – and during WWII, was offered a job at the University of Pennsylvania called a 'computer', where she worked on deciphering the routes of missiles.

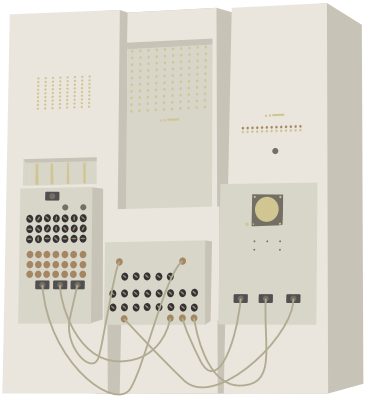


THE HYDROGEN BOMB

Kay was chosen for another secret programming job in 1945. However, the details of this project were beyond her security clearance, and she only discovered later that her team were testing out calculations for the Hydrogen bomb – a very deadly nuclear bomb.

ENIAC

Kay was very good at her job, and, in 1945 she was selected as one of only five women to work on a super-secret machine called ENIAC (Electronic Numerical Integrator and Computer). This was the world's first general-purpose computer, and it was so powerful, that it was able to carry out calculations in seconds that would take a person 40 hours or more to do! However, ENIAC had no memory, so Kay and the other 'computers' had to program the algorithms into it every day.



A small section of the ENIAC. The complete computer took up an area approximately the size of a tennis court

MARRIAGE

In 1948, Kay married John Mauchly, a renowned scientist who also worked on ENIAC, and she was forced to leave her job to concentrate on raising a family. While cooking, cleaning and raising seven children, Kay continued to work on her husband's computer projects from home, with her work being credited to him instead. It was only much later that her contribution to computer programming began to be recognised, with her induction into the 'Women in Technology International' (WITI) Hall of Fame in 1997.

Kay McNulty... quiz

1. To where and when did Kay's family emigrate?

2. Rearrange the letters to discover the name of the world's first general-purpose computer.

   IECNA

3. What was Kay's job title?
   Why do you think she was called that?

4. WWII played a big role in Kay's life. Using whatever materials are available to you, research and list three facts about WWII in the table below.

   WWII fact 1:

   WWII fact 2:

   WWII fact 3:

5. Kay married the co-inventor of ENIAC in 1948, and they went on to create new computers together. Imagine you are working with them, and you have a new idea for a computer. Being as inventive as you can, draw your computer and explain how it would work in the box below.

Answers: 1. Pennsylvania, USA, October 1924 2. ENIAC 3. She was called a 'computer' because her job was part of how the computer itself worked – it was only later on that computers took over this job themselves.

Activity... Become a Computer programmer

Did you know that every electronic item in your house had to be told how to operate in order for it to work? Computer programming refers to the way in which we give these instructions to computers. Now is your chance to try it out for yourself! Follow our steps below to become a computer programmer in your own home – the good news is, you don't even need a computer to take part!

Step 1:

COMPUTER SPEAK

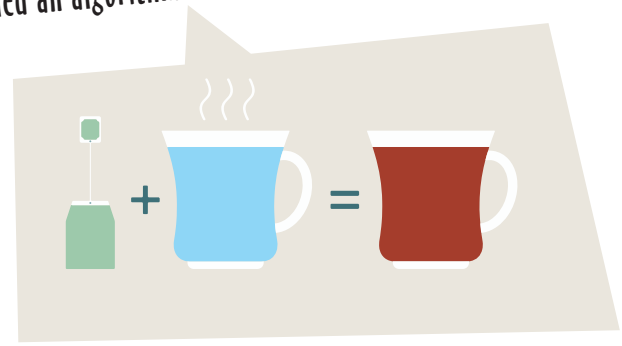
First, like any good computer programmer, you must get your terminology straight! Unjumble the letters to reveal these important computer terms, and have a go at writing them out below.

- 'RCOPTEMU ESIENCC' _____ is the study of information and computers.
- An 'AGOMITLHR' _____ is a set of instructions designed to tell a computer how to solve a task.
- 'CPEMROUT GOMIRAGMNRP' _____ is the act of giving these instructions to computers.
- A 'GNMPOGRRAMI AGLUNGEA' _____ is a language that computers use. Similar to how humans have many languages, such as English, Irish, French and German, computers also have many programming languages.
- Finally, 'DCOE' _____ refers to the words of the language.

Step 2:

CREATE AN ALGORITHM

Computers may be very fast, but most of them aren't very smart. They need to be told exactly how to do something in order to work, otherwise they will get stuck! Therefore, computer programmers design simple step-by-step instructions for them to understand, called an algorithm.



EXAMPLE: MAKING A CUP OF TEA

Before you design your own algorithm, we'll show you an example. First, we identify the task that we want to complete. For this example, we will be using something that many Irish people love, which is 'making a cup of tea'. Next, we need to work out the details of the problem or task – so in terms of tea, this might be what kind of tea we want, how many people are having tea, and what items we need to make it. Lastly, we need to break down the entire process into the simplest and clearest steps that we can, like the below:

TASK: MAKING TEA

1. Gather a kettle, a cup, a spoon, a teabag, milk and some sugar, and put them on the kitchen counter.
2. Fill the kettle with water.
3. Plug in the kettle and switch it on to boil.
4. Put a tea bag inside the mug.
5. Once the kettle is boiled, get an adult to carefully pour the boiling water from the kettle into the cup.
6. Leave the tea bag to soak for 2 minutes.
7. With a spoon, take the teabag out of the cup, and throw it into the compost bin.
8. Add a spoon of sugar and a small dollop of milk to the cup.
9. Stir the liquid in the mug 5 times with the spoon, to mix it all together.
10. Your tea is ready – be careful, it is hot!

NOW IT'S YOUR TURN!

Grab a sheet of paper and have a go at writing out your own step-by-step instructions for a simple task that you do every day, such as getting dressed, brushing your teeth, or going to bed.

Step 3: TRANSLATE A STORY

Computers don't use languages like we do. In order for a computer to understand us, we must translate our words into a programming language. Don't worry if you don't know any yet – as programming languages use a lot of symbols, we can practice this skill using emojis!

1: WRITE A STORY

First, write out a well-known story, such as the tale of Cinderella, Rapunzel, or Little Red Riding Hood. Computers like things explained very simply, so try to use as few sentences as possible!

2: TRANSLATE YOUR STORY

Now, translate your story into emojis! Slowly work through each sentence of your story, and choose some symbols that you think best represent the meaning. They don't have to be 'official' emojis! Remember to keep your story as simple and clear as possible by using as few emojis as you can.

3: SHARE YOUR STORY

Finally, show your finished emoji story to another person, and ask them to guess your story from the symbols. Did they guess correctly? If they didn't, you need to go back and 'problem-solve' by changing some symbols – a very important part of computer programming too! Share your emoji story with us at EPIC The Irish Emigration Museum by getting an adult to post them on social media using #EPICMuseum.

Congratulations! You are now a computer programmer!

COMPUTER SCIENCE TODAY

There are many inspiring Irish people who are pushing the boundaries of computer science and technology all around the world today and a lot of them started doing great things when they were kids just like you! Read a bit about them below, and head to their websites to learn more.

James Whelton

Cork native James Whelton was just 16 years old when he shot to fame for hacking an iPod Nano to create watch faces. He went on to co-found the CoderDojo movement in Cork at 18 years old – an organisation that now provides free coding clubs for kids around the world.

Website: https://coderdojo.com/

Twitter: @coderdojo https://twitter.com/CoderDojo

Instagram: @coderdojo https://www.instagram.com/coderdojo/

Sonia Flynn

Originally from Kildare, Sonia has had a high powered career as Director of User Operations in Google and Managing Director of social media giant Facebook. She is now Vice President of music tech company SoundCloud, and even owns her own blow dry bar called 'Roller' located in Dublin's Docklands area.

Website: https://soundcloud.com/

YouTube interview: https://www.youtube.com/watch?v=gBwcjL6ZmKU&feature=youtu.be

Patrick Collison

Patrick Collison is an Irish entrepreneur who, along with his brother John, founded 'Stripe', an American technology company that allows people to pay over the internet. Patrick began his career by taking part in the Irish BT Young Scientist and Technology Exhibition in 2005.

Website: https://patrickcollison.com/

Twitter: @patrickc https://twitter.com/patrickc

Instagram: @patrickcollison https://www.instagram.com/patrickcollison/

Shane Curran

Shane Curran is an Irish entrepreneur and founder of 'evervault', a technology company based in Dublin. He won the BT Young Scientist and Technology Exhibition in 2017, and his project provided the basis for long-term, secure storage of information in computers.

Website: https://www.linkedin.com/in/shanemcurran

Twitter: @arcurn https://twitter.com/arcurn

Instagram: @evervault https://www.instagram.com/evervault/

Sheree Atcheson

Sheree Atcheson is a Sri Lankan-born Irish computer scientist. A women's rights supporter and the Head of Diversity and Inclusion at the online bank, 'Monzo', she is also the Global Ambassador for the organisation 'Women Who Code'.

Website: https://www.womenwhocode.com/

Twitter: @nirushika https://twitter.com/nirushika

Instagram: @_nirushika_ https://www.instagram.com/_nirushika_/

Steven Collins

Steven Collins is a Professor of Computer Graphics at Trinity College, Dublin. A lover of computer games, he helped to found the company 'Havok', that provides cutting-edge software to enable computer games and films to work.

Website: https://www.havok.com/

RESOURCES

Want to learn a little more about computer programming?

Check out these other fantastic resources! And don't forget to join us at EPIC The Irish Emigration Museum for one of our upcoming Techxibit workshops where you can learn to code and take on a coding challenge, such as creating your own mini-EPIC museum game using Scratch coding for kids! Head to our website epicchq.com for more info.

Books

Hello Ruby: Adventures in Coding by Linda Liukas – Join Ruby, an imaginative girl, as she goes on fun adventures learning lessons about pattern recognition, computational thinking, and other concepts vital to understanding coding.

Coding Games in Scratch by Jon Woodcock – A wonderful step-by-step visual guide to building your own computer games for kids.

Coding for Beginners Using Scratch: Lift-the-Flap Computers and Coding by Usborne Publishing – A series of popular programming books for younger kids who want to learn how to code their own computer games.

How to Code a Sandcastle by Josh Funk - This book tells the story of Pearl, a girl who creates a sandcastle with the help of her robot, while also teaching young readers basic coding terms.

EPIC The Irish Emigration Museum

Discover hi-tech history that's truly inspiring at EPIC The Irish Emigration Museum. At EPIC we explore the history of Ireland at home and abroad, showcasing the incredible feats of influential Irish figures around the world, such as explorer Ernest Shackleton!

Covering a range of topics – from science and art to storytelling, music and sport – and offering workshops for explorers of all ages, visit us to experience history like you never have before.

Head to epicchq.com to discover more.