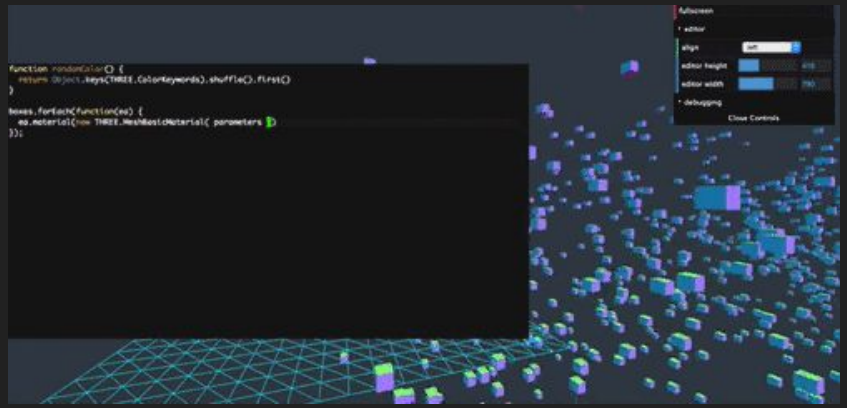
Programming Merit Badge

Programming?



Programming!

So what is programming, anyway?

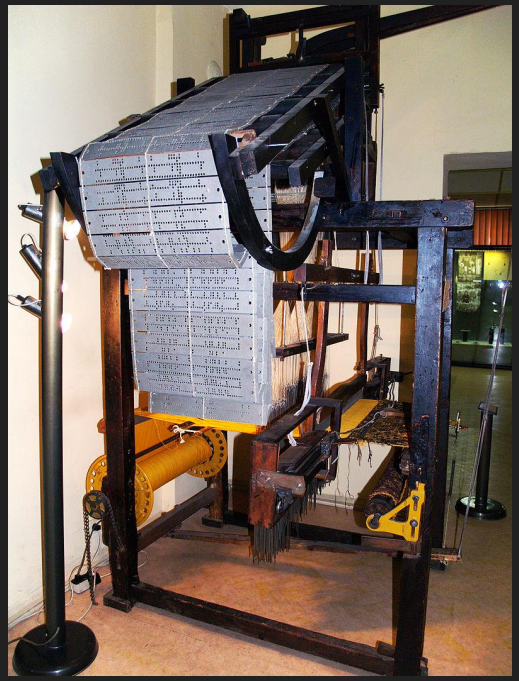
program (v): provide a computer or other machine with coded instructions for the automatic performance of a particular task.

computer *(n)*: a device that can be instructed to carry out arithmetic or logical operations automatically.

Computers have been around for a long time.

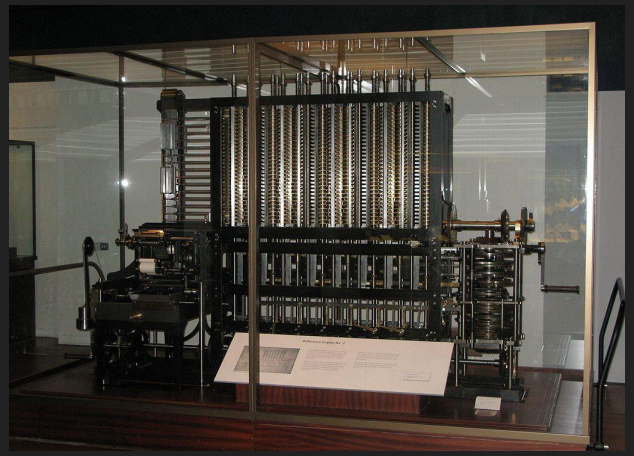
Ankythera Mechanism

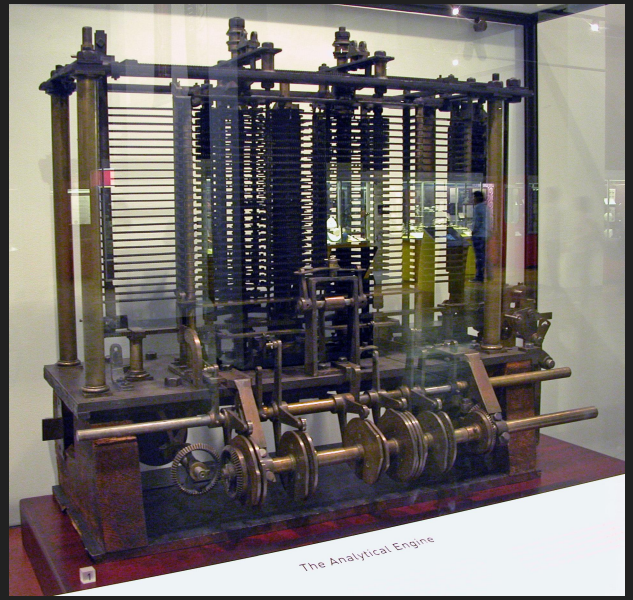
Greece - ~200 BC



Jacquard Loom

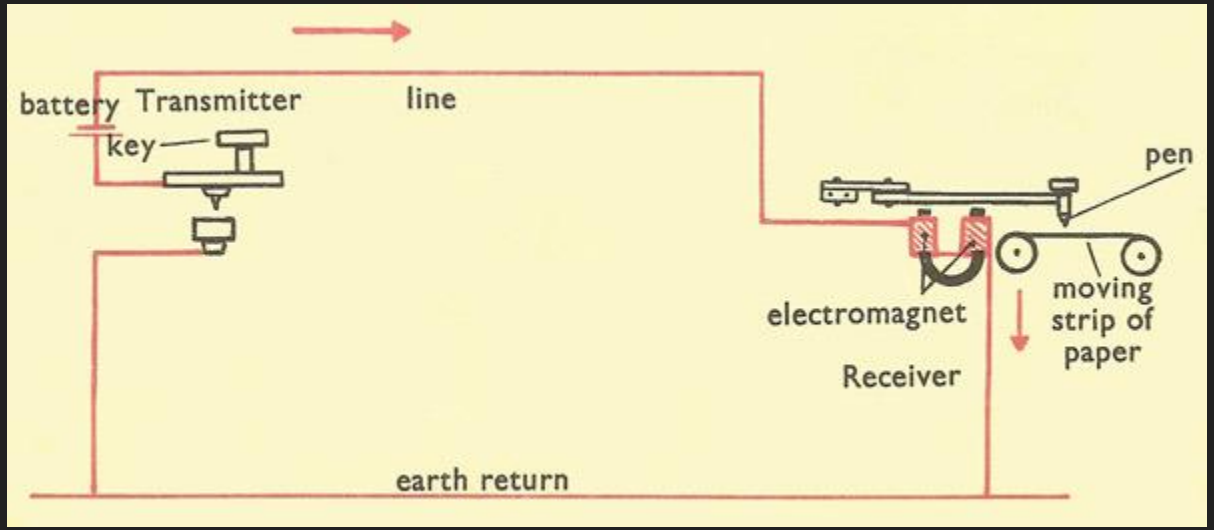
France - 1801





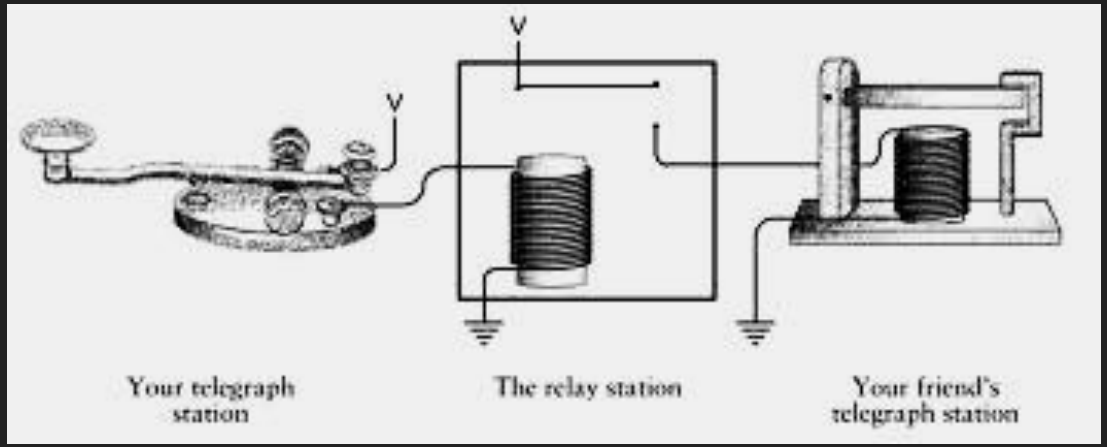
Difference Engine
England - Designed in 1822

Analytical Engine
England - Designed in 1837



Telegraph

1830’s

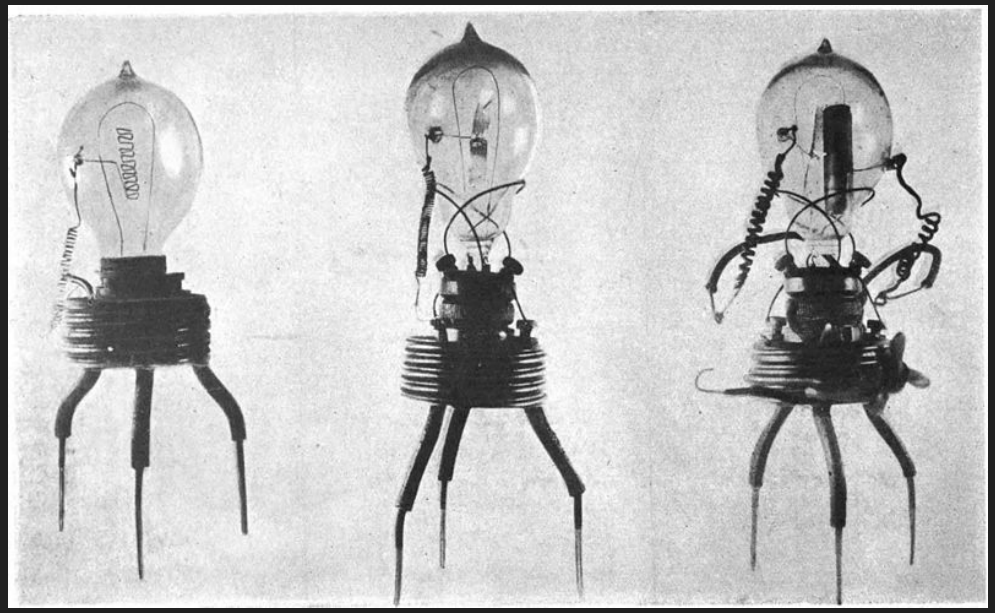


Electronic Relay

1835

Tabulating Machine

New York - 1890

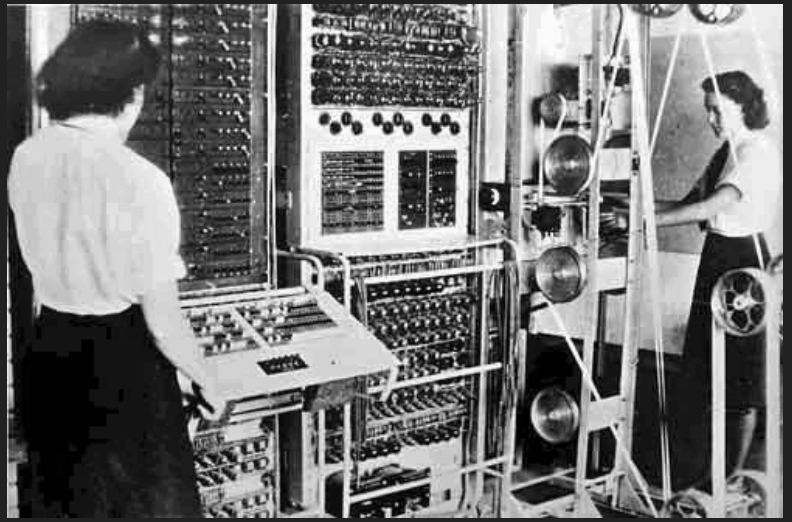


Vacuum Tubes

England - 1904

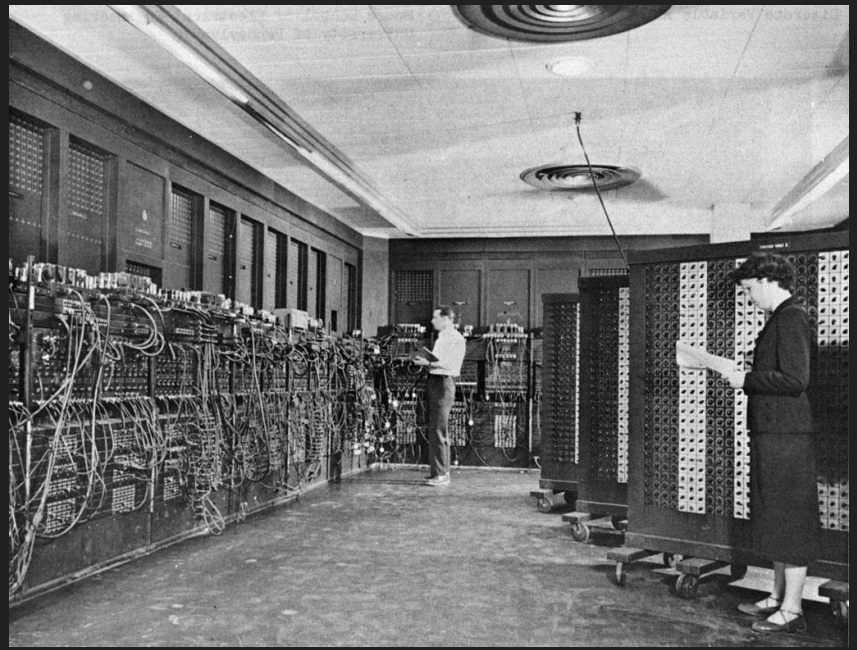
Bombe

England - 1939



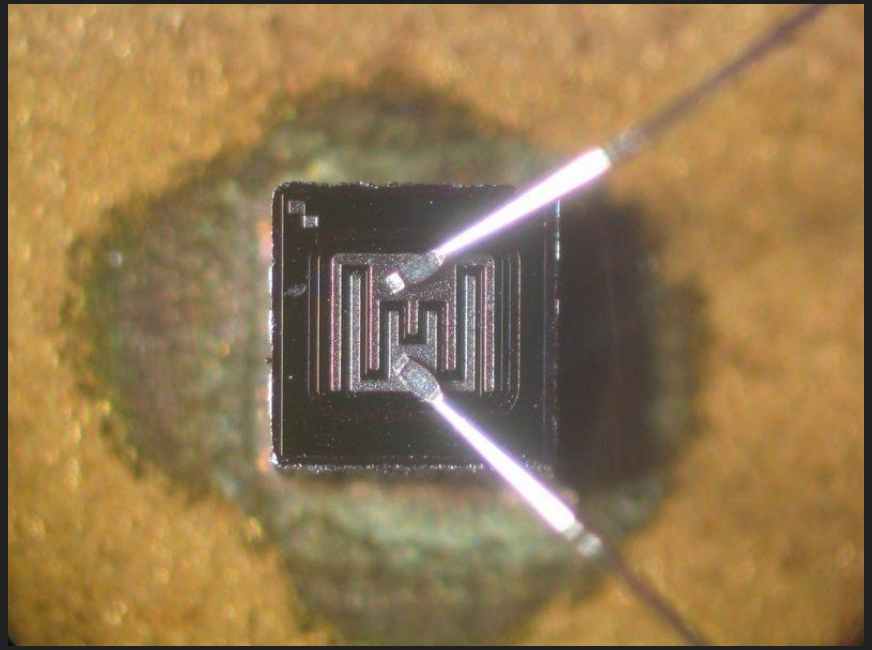
Colossus

England - 1933



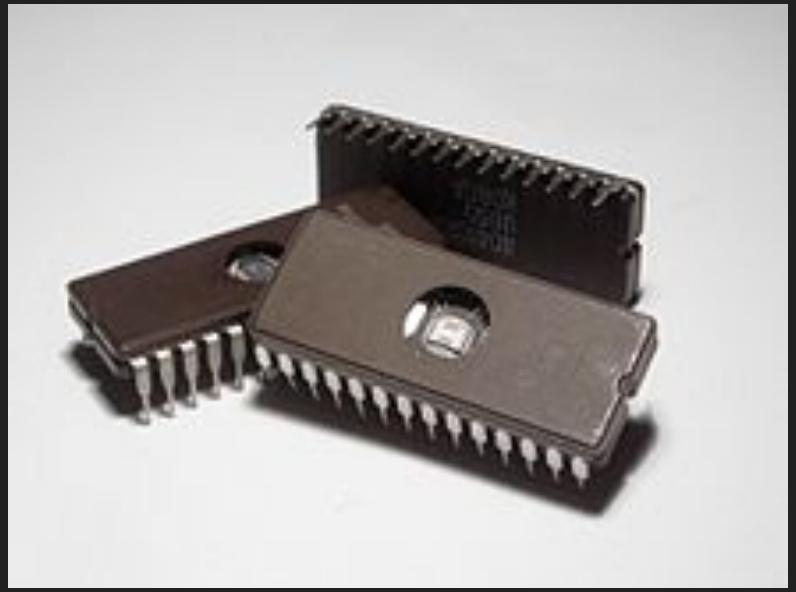
ENIAC

Pennsylvania - 1946



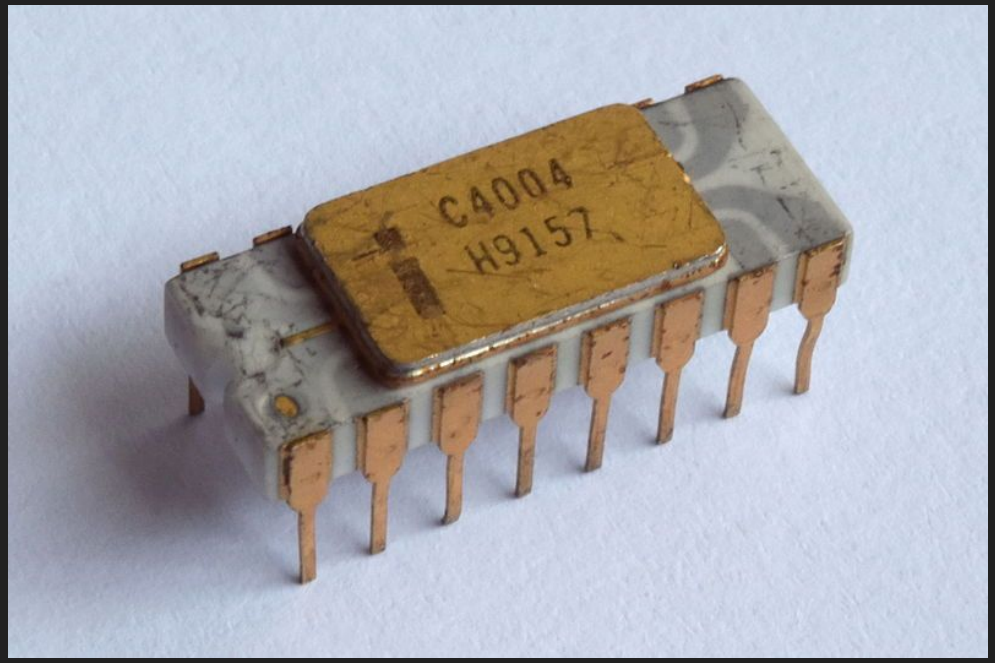
Transistors

New York - 1947



Integrated Circuits

Texas - 1958



Microprocessors

California (and lots of other places) - 1971

All of this research & invention also caused a lot of legal issues.

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Can anyone really “own” basic math & logic?

All of this research & invention also caused a lot of legal issues.

Where’s the line between creation and discovery?

All of this research & invention also caused a lot of legal issues.

What happens when I quit my job & take the new tech I've been developing with me?

All of this research & invention also caused a lot of legal issues.

Do I own my ideas or does my employer?

Fortunately, the legal system already had some tools in place to answer these questions.

patent *(n)*: a government authority or license conferring a right or title for a set period, especially the sole right to exclude others from making, using, or selling an invention.

copyright *(n)*: the exclusive legal right, given to an originator or an assignee to print, publish, perform, film, or record literary, artistic, or musical material, and to authorize others to do the same.

trademark *(n)*: a symbol, word, or words legally registered or established by use as representing a company or product.

Fortunately, the legal system already had some tools in place to answer these questions.

These tools are still evolving to catch up with technology.

Software can be patented.

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This can be somewhat controversial.

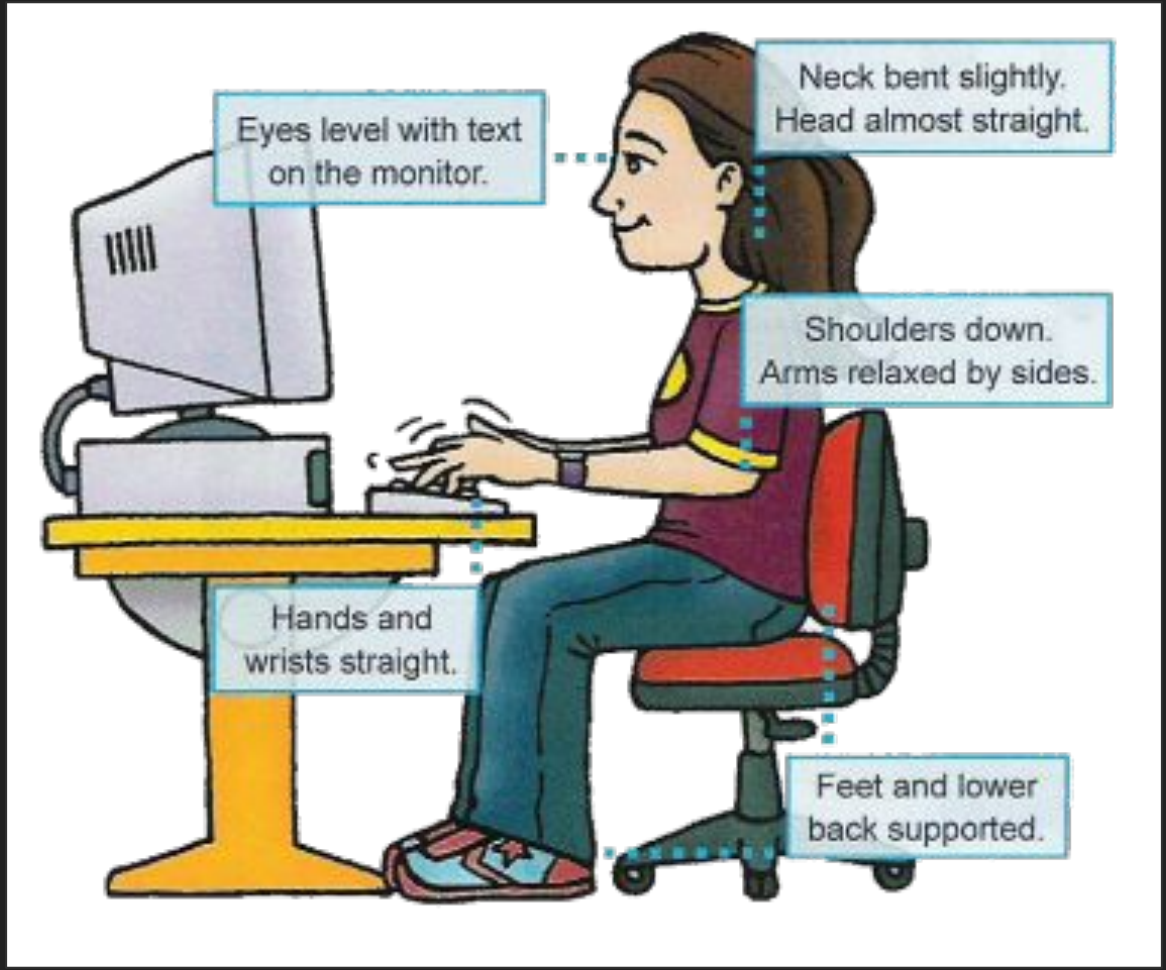
Some people & companies decide to release **open source** programs.

Programming-Related Injuries???

Programming-Related Injuries

Carpal Tunnel

Eyestrain


Eyes level with text on the monitor.
Neck bent slightly. Head almost straight.
Shoulders down. Arms relaxed by sides.
Hands and wrists straight.
Feet and lower back supported.

Programming-Related Injuries

Carpal Tunnel

Eyestrain

In order to start programming, we need to find a language that both people & computers can understand.

Early programmable computers only understood their native **machine code** - sequences of numbers that told the computer what to do.

All programs eventually need to get turned into machine code by being **compiled** or **interpreted.**

Assembly is a slight simplification over machine code - instead of having to remember that a 4 means “add these numbers together”, we can just remember “ADD”.

C is a popular language invented in the 70’s. It has a lot of nice things & is much easier to read & write compared to Assembly. C is still widely used today, and many languages have been inspired by C.

FORTRAN is regarded as the first “high level” language - a language that takes care of a lot of the technical details. FORTRAN isn’t used much in new projects today, but lots of big businesses still rely on old FORTRAN systems to do lots of important things.

LISP is a very different way of thinking about programming based entirely around **functions**. It's pretty popular in certain scientific fields & artificial intelligence work.

Smalltalk introduced the idea of **objects**, which make it easier to organize & think about large programs.

C++ brought objects & some other handy features to C in the early 1980’s.

Java pioneered the idea of compiling programs to a form that later gets interpreted by another program.

Python is a high-level language used a lot in the science & engineering community.

Ruby is another high-level language used mostly in web development.

Javascript is used on web pages to make them interactive.

Scratch is a drag-n-drop programming language that makes it easy to learn how to program.

Let’s go write some code!