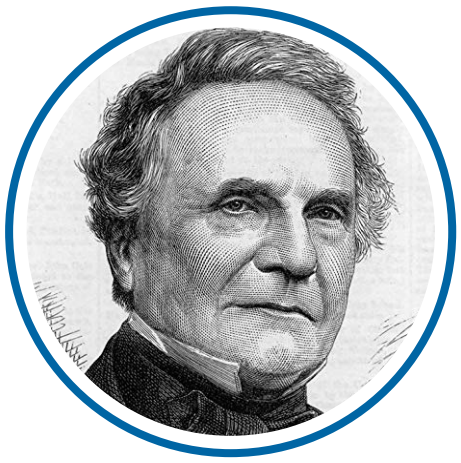
ICT Innovators

First computer designer First computer programmer

Charles Babbage and Ada Lovelace

Charles Babbage
1791 - 1871

A mathematician and prolific inventor, Babbage is often considered to be the father of computing for his work on the first mechanical computer. Babbage's machine carried out calculations using levers and gears rather than the electrical circuits of today. It had many technical components, including a unit that allowed for loops and memory leading to the modern computers we have today.



Ada Lovelace
1815 - 1852

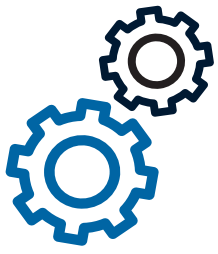
Born Augusta Ada Byron, the daughter of the poet Lord Byron, Ada Lovelace was given a mathematical education on the insistence of her mother. Lovelace worked with Charles Babbage translating and annotating works of an Italian engineer. It was through her extensive notes on the translation that she wrote what is considered to be the first computer program: an algorithm to be used on a machine!

> At each increase of knowledge, as well as on the contrivance of every new tool, human labour becomes abridged (shortened).
>
> **Charles Babbage**

> [The Analytical Engine] might act upon other things besides numbers...
>
> **Ada Lovelace**

Fast facts

Lovelace was one of the first to suggest a computer might act on something **other than numbers**



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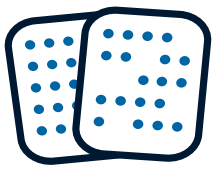
The **programming language** used by Lovelace was similar to **modern assembly languages**

Babbage built **two** machines: **The Difference Engine** and **The Analytical Engine**

Data and programs were provided to the Analytical Engine by **punch cards** which represented data.



If The Difference Engine had been completed, it would have weighed over **15 tonnes**

Encyclopædia Britannica. (2019). Charles Babbage. Retrieved from https://www.britannica.com/biography/Charles-Babbage Encyclopædia Britannica. (2019). Ada Lovelace. Retrieved from https://www.britannica.com/biography/Ada-Lovelace Images: Charles Babbage, engraving from 1871 [Image] (1871). Retrieved from https://www.britannica.com/biography/Charles-Babbage/media/1/47371/218439 Ada Lovelace, c. 1838 [Image] (1838). Retrieved from https://www.britannica.com/biography/Ada-Lovelace/media/1/349551/218453 Vectors from www.freepik.com

ICT Innovators

Activity 2 – Broken Difference Engine

One of the first ever computers was known as a Difference Engine. This mechanical device would spin wheels with numbers attached. Each wheel would then turn the wheel next to it based on the connection of gears between each wheel.

These Difference Engines could be used to do large amounts of mathematical calculations such as trigonometry and quadratic equations.

How do Difference Engines Work?

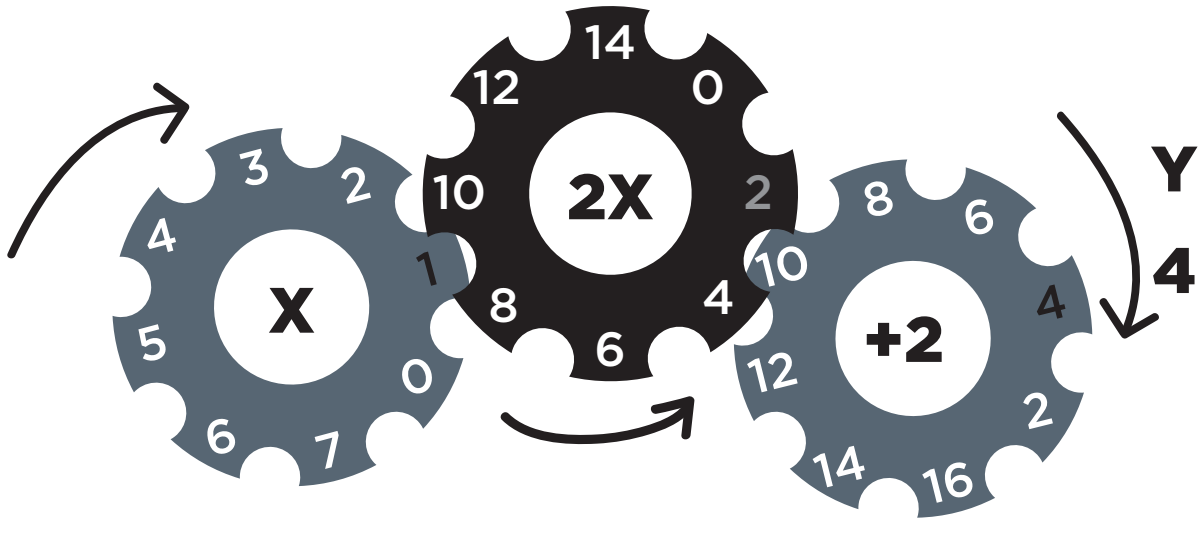
Take the equation Y = 2X+2

When the X wheel is at 1 the final wheel gives a Y value of 4.

Trace what would happen if the X wheel is turned one turn.

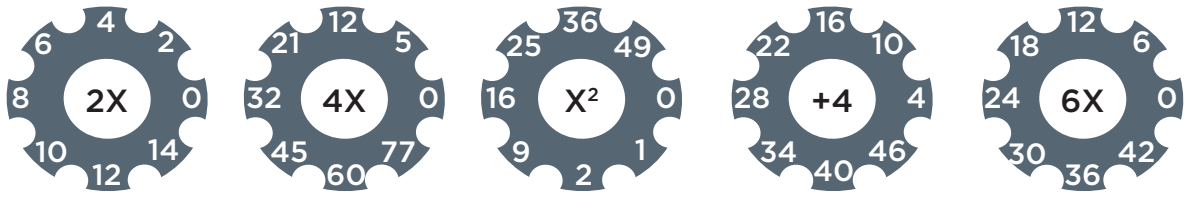
X	Y
0	2
1	4
2	6
3	8

Table of results created by this engine

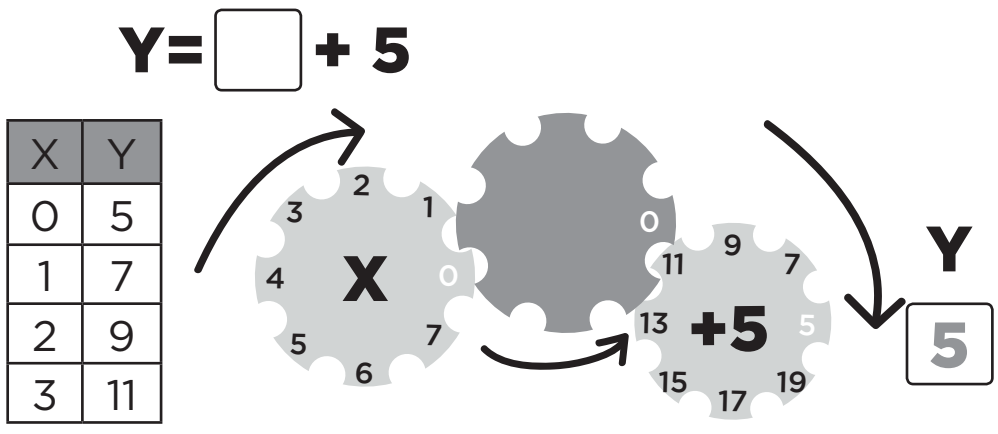


Broken Difference Engines

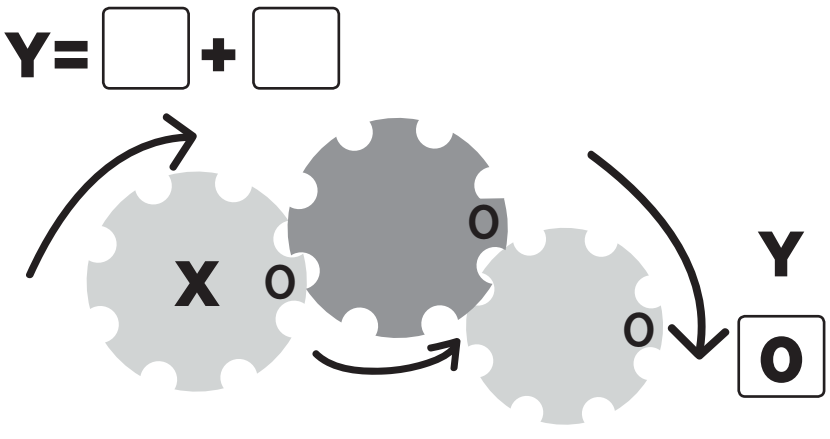
The difference engines below are missing one or more of the following wheels.



Can you figure out which wheel belongs where?



X	Y
0	5
1	7
2	9
3	11



X	Y
0	0
1	5
2	12
3	21

Algorithmic Thinking

Can you work backwards from the table to come up with a difference engine for these results?

X	Y
0	4
1	10
2	16
3	22