**Level 1: Charles Babbage & Ada Lovelace**

1. Who was Charles Babbage?
   1. When and where was he born?

He was born on the 26th of December 1791 in Southwark, London

* 1. What was his main contribution to computer science?

He is considered by some to be a “father of the computer”. Charles Babbage is credited with inventing the first mechanical computer that eventually led to more complex electronic designs, though all the essential ideas of modern computers are to be found in Babbage’s analytical engine.

1. What is the "Difference Engine" proposed by Charles Babbage?
   1. What did it do?

The difference engine was an automatic mechanical calculator designed to tabulate polynomial functions

* 1. How did it work?

The machine used the decimal number system and was powered by cranking a handle.

* 1. How was it similar to modern computers?

It is similar to modern computers because it finds information, specifically number information.

1. Who was Ada Lovelace?
   1. When and where was she born?

She was born on the 10th of December 1815 in London, England

* 1. What was her main contribution to computer science?

She was the first to recognize that the machine had applications beyond pure calculation, and published the first algorithm intended to be carried out by such a machine.

* 1. What is the computer language that is named after her?

The computer language that was named after her was Ada.

1. What is the "Analytical Engine" worked on by Ada Lovelace?
   1. What did it do?

The Analytical Engine incorporated an arithmetic logic unit, control flow in the form of conditional branching and loops, and integrated memory, making it the first design for a general-purpose computer that could be described in modern terms as Turing-complete.

* 1. How did it work?

The Analytical Engine worked by evaluating finite differences to create approximating polynomials.

* 1. How was it similar to modern computers?

It is similar to modern computers because the input which consisted of programs and data was to be provided to the machine and the method of doing this at the time was direct mechanical looms.

**Level 2: Alan Turing**

1. Who was Alan Turing?
   1. When and where was he born?

He was born on June 23rd 1912 in Maida Vale, London, England

* 1. What was his main contribution during World War II?

His main contribution during WW2 was that he made the Enigma which was a machine that enabled his British allies to intercept code messages from the Nazi’s eventually helping them to win the war.

* 1. What were his main contributions to computer science after World War II?

His contributions to computer science after WW2 were that he designed the ACE among the first designs for a stored program computer. In 1948, Alan Turing joined the computing machine laboratory where he helped develop the Manchester computers.

1. What is the "Enigma" that Alan Turing worked on during World War II?
   1. What was the "Enigma code" used by the Germans and how did it work?

The Enigma code was a machine that the Nazi’s used to send coded messages to each other. The Enigma machine is an electro-mechanical device that is mechanically operated with an electric signal passed through wires and various mechanical parts.

* 1. Why was it so important for Britain to "crack" the Enigma code?

It was so important because at one point in the war, Britain was losing and the Nazi’s were getting the upper hand and so with Britain being able to crack the code, they were able to intercept the coded messages that the Nazi’s were communicating with each other.

* 1. How did Alan Turing solve the puzzle?

Alan Turing during this time period created a machine known as The Bombe. It was

crucial in cracking German communications that were encoded by the Enigma Machine.

Turing’s machine, which was a precursor to what we now think of as a computer, was

able to rapidly speed up the rate at which intercepted messages were decoded, allowing

British forces to react accordingly within hours rather than weeks.

* 1. Why was Turing's work kept top secret?

Turing’s work was kept top secret because of his sexual orientation. He was ridiculed

because he was homosexual and because of this, I am assuming that the British

government/military didn’t want to acknowledge what he had done because, society was

not as accepting of gay people than they are right now.

1. Many people call Alan Turing the "Greatest Unknown Hero of World War II". Provide some examples of the impact of his work that would support this claim.

* He was able to crack the Enigma Code
* He created a machine that was able to counter the Enigma’s capabilities

1. How did being gay affect Alan Turing's life and work as a computer scientist?
   1. How did being gay affect his work during World War II?

Him being gay probably affected his work during WW2 by him helping the British

army, but he was not recognized for his work and his help, he was neglected by his

peers about him being gay.

* 1. How did being gay affect his work after World War II?

Him being gay affected his work after the war by him committing suicide which spread

abroad so maybe then he was recognized for his work then rather than before.

* 1. How did Alan Turing's life end?

Alan Turing’s life ended in him committing suicide in 1954 because he was persecuted

gay which drove him to take his own life.

1. Many people call Alan Turing the "Father of Computer Science". Provide some examples of the impact of his work that would support this claim.

* Cracking the Enigma Machine during WW2
* Turing Machine
* Turing Test
* Unorganised machine
* LU Decomposition (lower-upper)

**Level 3: Other Great Contributors**

1. Who was John von Neumann?
   1. When and where was he born?

He was born on December 28th 1903 in Budapest, Austria-Hungary

* 1. When and why did he move to America?

It is said that he moved to america possibly in the late 1920’s to early 1930’s and he

moved there to pursue his career in his best subject fields like math, economics, and

statistics.

* 1. What was his contribution to mathematics & science?

John von Neumann made foundational contributions to [ergodic theory](https://en.wikipedia.org/wiki/Ergodic_theory), a branch of

mathematics that involves the states of [dynamical systems](https://en.wikipedia.org/wiki/Dynamical_systems). Von Neumann founded the

field of [continuous geometry](https://en.wikipedia.org/wiki/Continuous_geometry). It followed his path-breaking work on rings of operators. Between 1937 and 1939, von Neumann worked on [lattice theory](https://en.wikipedia.org/wiki/Lattice_(order)), the theory of [partially ordered sets](https://en.wikipedia.org/wiki/Partially_ordered_set) in which every two elements have a greatest lower bound and a least upper bound

* 1. What was his contribution to computer science?

His contribution to computer science was that he worked on the philosophy of Artificial

Intelligence with Alan Turing. Von Neumann was a founding figure in computers, he

developed the merge sort algorithm in which the first and second halves of an array are

each sorted recursively and then merged.

1. What was the "ENIAC" computer and the "von Neumann Machine"?
   1. What did it do and how did it work?

It was among the earliest electronic general purpose computers made, it was digital and

able to solve a large class of numerical problems through reprogramming. It was

primarily used to calculate artillery firing tables.

* 1. How is it related to modern computers?

It is related to modern computers because these computers main purposes

were to be able to solve math and arithmetic which is a modern day computer

capability.

* 1. Explain how a "von Neumann Machine" applies to modern PCs.

The Von Neumann Machine applies to modern PC’s because the VM Machine was a

stored program digital computer that keeps both program instructions and data in

read-write, and there was a RAM.

1. Who was Grace Hopper?
   1. When and where was she born?

She was born on December 9th 1906 in New York City, New York, United States

* 1. What were some of her contributions to computer science?

She was one of the first programmers of the Harvard Mark I computer.

She invented one of the first compiler related tools. She popularized the idea of

machine-independent programming languages, which led to the development of

COBOL.

1. What was the "COBOL" computer language that Hopper helped to develop?
   1. How was COBOL different from other computer languages of the time?

COBOL is primarily used for business, finance, and administrative systems for

companies and governments. It is a compiled English-like computer programming

language designed for business use. COBOL was different because it was created as part of a [US Department of Defense](https://en.wikipedia.org/wiki/US_Department_of_Defense) effort to create a [portable](https://en.wikipedia.org/wiki/Software_portability) programming language for data processing

* 1. Is COBOL still in use today? Explain your answer.

COBOL is still used today but in more mainframe computers such as large scale batch

and transaction processing jobs. However, it has declined in terms of its popularity,

due to the retirement of experienced COBOL programmers but now the programs are

being migrated to new platforms, it is now rewritten in modern languages or replaced

with software packages.

1. Who is Tim Berners-Lee?
   1. When and where was he born?

He was born on June 8th 1955 in London, England.

* 1. Why was he knighted by Queen Elizabeth II?

He was knighted by Queen Elizabeth II because of his pioneering work, for

services to the global development of the internet.

* 1. What is his contribution to computer science?

He is best known as the inventor of the world wide web.

1. List some ways that your life would be different if Tim Berners-Lee did not invent the World Wide Web.

* I would be more engaged in the real world
* I would be more physically active
* I would read more
* I would not be on my devices as much as I would
* I would not be into technology as much as I am

**Level 4: Presentation**

Pick one of the above "heroes" of computer science and prepare a brief presentation about their life and contributions.

Your presentation will be shared with other students in the class in a "trade show" format. (When we return from Christmas break.)

Your presentation should be shared with Mr. Nestor through Google Docs or via email at p0079141@pdsb.net.