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

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

He was born in London, United Kingdom in 1791.

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

Charles Babbage created the first ever mechanical computer.

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

It tabulated polynomial functions as an automatic mechanical calculator.

* 1. How did it work?

You write the polynomial equation you would like to solve and then turn a lever. The answer would come out.

* 1. How was it similar to modern computers?

It could solve complex math equations in polynomial functions and modern computers can solve complex math equations as well.

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

She was born in London, United Kingdom in 1815.

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

She created programs for the analytical engine. She also created the first programming language.

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

The name of the computer language named after her is Ada.

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

It was a general-purpose, fully program-controlled automatic mechanical digital computer. It would be able to perform any calculation set before it.

* 1. How did it work?

Data was to be entered on punched cards, using the card reading technology of the Jacquard loom. Instructions were also entered on cards. It executed answers in sequential or non-sequential order.

* 1. How was it similar to modern computers?

It was actually the first computer to be designed and partly built.

**Level 2: Alan Turing**

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

Alan Turing was born on June 23, 1912 in Maida Vale.

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

His main contribution during World War II was that he broke the so called unbreakable German military codes. Without him, the Allies would have lost the war.

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

He laid down the groundwork for modern computing and theorized about artificial intelligence.

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 type of enciphering machine used by the German armed forces to send messaged securely. You type a plain text into the keyboard and each type a letter on the lampboard lights up. This turns your message into a seemingly random series of letter which then is given to your radio operator who transmits it into morso code. Then the radio operator at the other end copies down this series of random letters and hands them to his crypto specialist. This crypto specialist then sits down at an enigma machine that is set up identically to the one used to send the message and types it in which then starts spelling out the original plaintext message. An example of the Enigma Code if you would like to try it is at: <https://www.nytimes.com/paidpost/the-weinstein-company/world-war-iis-greatest-hero-the-true-story-of-alan-turing.html>

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

Britain was losing the war and Germany had a good chance of winning. So they needed to know the plans of the Germans so that they could beat them to it and win the war.

* 1. How did Alan Turing solve the puzzle?

Alan Turing along with his colleague Gordon Welchman, made their own version of the Bombe machine(originally made by the Poles) which helped to decipher codes. But this machine took too much time to decipher one code and Britain did not have that much time. So Akan Turing found a flaw in the encrypted enigma code. No encrypted letter meant itself. Meaning if they typed “s” it would never come out as s it would be any other alphabet. Turing knew that there was one phrase “Heil Hitler” put after every encrypted message which eventually lead to the defeat of Germany.

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

Turing’s work was kept top secret because Britain did not want Germany to know that they had cracked their enigma code. They knew that Germany would keep using the “Enigma code” and it would benefit them because Britain would know every move of the Germans.

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.

Yes, Alan Turing is the “Greatest Unknown Hero of World War II”. The “Enigma code”, which was considered to be impossible to break, was cracked by Alan Turing. Britain had almost lost the war if it hadn’t been for Alan Turing. His ability to spot the flaw in the code was outstanding. But his work was asked to be top secret even after world war II. Britain wanted to use this to their advantage and did not want the Germans to know that they had managed to crack their “Enigma code”. His work was only shown to the public around 20 years ago. He had also prevented millions of people from losing their lives.

1. How did being gay affect Alan Turing's life and work as a computer scientist?

His security clearance was removed and he was barred from continuing his cryptographic consultancy for the Government Communications Headquarters (GCHQ). He was denied entry into United Stated but was free to visit other European countries.

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

It didn’t affect his work during World War II as he did not have a gay relationship until 1952.

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

Alan was not allowed into many places for the fact that he was gay. He had to go through chemical castration(estrogen injection that killed a man’s sex drive). This hormone therapy caused Turing to grow breasts and he went into depression as there was no one with him anymore to provide support.

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

Alan Turing committed suicide using cyanide poisoning, 2 years after he was convicted for being gay.

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.

Alan Turing is considered to be the “Father of Computer Science” because he formed the concept of algorithms and computations was one of his inventions. He was very smart and knew how to solve advanced problems without even knowing calculus. He created the Turing machines which were symbol manipulating devices that can be adapted to stimulate the logic of any algorithm, no matter how complex. Alan Turing also advanced the field of artificial intelligence. He also created the Turing test which is a test taken by a computer to tell if it can pass as a human being.

**Level 3: Other Great Contributors**

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

He was born on December 28, 1903 in Budapest, Hungary.

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

He moved to America in 1930 because he wanted to teach at Princeton University in New Jersey. Also there were many job opportunities in America.

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

He created the field of cellular automata without the help pf computers, constructing the first self-replicating automata with pencil and graph paper. His interest in meteorological prediction led him to propose manipulating the environment by spreading colorants on the polar ice caps to enhance absorption of solar radiation. Thereby raising global temperatures.

* 1. What was his contribution to computer science?

He contributed to the development of game theory as a mathematical discipline and established a theorem that in certain zero sum games with perfect information, there exists a strategy for each player which allows both players to minimize their maximum losses.

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

They were both computers. The ENIAC computer was a general purpose computer and the Von Neumann Machine was designed as a stored program computer.

* 1. How is it related to modern computers?

The Von Neumann Machine serves as the basis for almost all modern computers. Modern computers are very fast whereas the ENIAC was very slow.

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

The Von Neumann Machine applies to modern PCs as they use the same method of stored programs.

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

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

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

She invented one of the first compiler related tools. She also helped in the making of UNIVAC which is the first known large-scale electronic computer on the market in 1950.

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

It was different from other computer languages because Hopper believed that programs should be written in a language that was close to English.

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

Yes COBOL is still used in business, finance, and administrative systems for companies and governments. It is also still widely used in legacy applications and deployed on mainframe computers, such as large-scale batch and transaction processing jobs.

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

He was born on June 8, 1955 in London, United Kingdom.

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

He was knighted by Queen Elizabeth II for his pioneering work.

* 1. What is his contribution to computer science?

He invented the World Wide Web which is used by millions of people across the world and has helped to make the lives of many people much easier.

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

-If I wanted to have a quick answer to a question, it wouldn’t have been that possible.

-I would not get multiple answers to a question.

-I would not have been able to interact with people around the world.

-I would not be able to watch my favourite YouTube videos.

**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 form Christmas break.)

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