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

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

Charles Babbage was born on December 26, 1791 in London.

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

Charles Babbage’s main contribution to computer science was the invention of the “Difference Engine 2”.

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

The machine calculated the value of polynomials.

* 1. How did it work?

A crank was pulled and gears would move in order to solve the equations.

* 1. How was it similar to modern computers?

The Difference Engine is similar to modern computers because it used decimal digits to operate and it was a calculator.

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

Ada Lovelace was born on December 10, 1815 in London, England.

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

Her main contribution to computer science was the invention of the Analytical Machine.

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

There was an early programming language named “Ada” that was named after her.

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

The machine was able to calculate polynomials using addition.

* 1. How did it work?

It worked by providing output to the user after they inputted information into it using punch cards.

* 1. How was it similar to modern computers?

The Analytical Engine is similar to modern computers because it used analog systems and it included many computer concepts.

**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 London, England.

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

He created a computer that was able to crack the Enigma code that was secretly used as communication by the Russians in the second World War

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

Alan Turing created an Abbreviated Code which was the first thing that began computer programming. Also, he had developed an artificial intelligence test called the “Turing Test” which was an investigation on whether a computer could be identified by its messaging.

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 cipher system that was used by the Germans to communicate secretly. It worked by typing in a message and then mixing it up by using rotors and notched wheels.

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

It was important for Britain to “crack” the Enigma code because they were very close to being defeated by the Germans in the second World War.

* 1. How did Alan Turing solve the puzzle?

Alan Turing solved the puzzle by creating a computer called the “Bombe” and by identifying that each letter in the code was encrypted as another letter that itself. He had also identified that the two words “Heil Hitler” were used at the end of their code which had limited a large number of possible outcomes.

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

Turing’s work was kept top secret because his computers were able to decipher 3,000 codes per day during the World War. If the Germans were able to find out about the cracked Enigma code, then they would have made it more secure.

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.

Some examples of the impact of Alan Turing’s work was that his Bombe computers were able to crack a total amount of 2.5 million messages and this was useful in identifying the strategies and plans that the Germans made. Also, Alan Turing’s contribution in helping the British crack the code of the German communication had estimated that the second World War was shortened by two years.

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?

Some of Alan Turing’s work was ignored due to being gay.

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

Alan Turing was disqualified from code-breaking work of the government and was prosecuted which had meant that he was no longer able to work after the second World War.

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

Alan Turing ended his own life by committing suicide in the year 1954. He committed suicide by obtaining cyanide poison.

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.

Examples for this claim are that Alan Turing had created the “Turing Machine”, he had helped crack the Enigma code during the second World War, he created the “Abbreviated Code” which was the beginning of computer programming, and he had created the “Turing Test”. These examples not only impacted World War II, but they have contributed to the development of computer science therefore making him the “Father of Computer Science”.

**Level 3: Other Great Contributors**

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

John von Neumann was born on December 28, 1903 in Budapest, Hungary.

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

He moved to America in the year 1930 because the Nazis were taking power over Hungary.

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

John von Neumann had wrote a book on math called the *Theory of Games and Economic* *Behavior* in the year 1944 and was also an applied math teacher at Princeton, New Jersey.

* 1. What was his contribution to computer science?

John von Neumann contributed in creating the first computer that stored programs with Alan Turing Claude Shannon. He had also been a pioneer in game theory.

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

The “ENIAC” computer was an electronic calculating machine used for solving numerical problems and it worked by plugging in vacuum tubes. The “von Neumann Machine” was able to keep data and instructions in a single store as well as encode instructions. The “von Neumann” machine read instructions electronically by using plugboards.

* 1. How is it related to modern computers?

The ENIAC computer is related to modern computers because it is digital, it did not slow down by any mechanical parts, and it was able to calculate numerical problems

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

A “von Neumann Machine” applies to modern PCs because it used memory, it was electronic, and it’s instructions were able to be read by other computers.

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

Grace Hopper was born on December 9, 1906 in New York, U.S.

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

She contributed in computer science by helping in the creation of a commercial electronic computer and by creating applications for the “COBOL” computer language.

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 was different from other computer languages such as C++, Java, and Python because it uses phrases that are in English so that it can easily be understood rather than having shortened functions.

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

Yes, COBOL is still in use today but it is no longer used in schools because it contains a large amount of text. In schools, COBOL is replaced by programming languages that contain short functions such as C++ and Python. COBOL is still used by governments, business, and finance. Also, mainframe computers that contain legacy applications still use COBOL in a large amount.

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

Tim Berners-Lee was born on June 8, 1955 in London, England.

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

He was knighted by Queen Elizabeth II because of his contribution in the global development of the internet.

* 1. What is his contribution to computer science?

Tim Berners-Lee had created the World Wide Web, the first server and web client, and a program called Enquire.

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

My life would be different if Tim Berners-Lee did not invent the World Wide Web because my only source for research would be from reading books, I would not be able to message my teachers for extra help, and I would not be able to download files for school purposes.

**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.