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

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

Born on December 26, 1791 in London, United Kingdom

* 1. What was his main contribution to computer science?
* He created the first mechanical computer which was a calculator that solves polynomials, and uses differences in squares.
* Developed a Analytical Engine. Like the Difference Engine, the Analytical Engine was never fully constructed, but the design was highly influential
* His designs had important concepts used in modern computers, including the separation of data and program memory, instruction-based operations, program control using conditional jumps, and a discrete unit for input/output.

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

It calculated and tabulated polynomial functions. Which was a machine to calculate a series of values and print results automatically in a table.

* 1. How did it work?

The Difference Engine was a digital device that operated on discrete digits and the digits were decimal (0–9), represented by positions on toothed wheels. Data was stored temporarily for later processing and it was designed to stamp its output into soft metal, which would later be used to produce a printed plate.

* 1. How was it similar to modern computers?

Like modern computers, the Difference Engine had storage where data could be held temporarily for later processing and it was designed to stamp its output into soft metal, which would later be used to produce a printing plate.

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

Born on December 10, 1815 in London, United Kingdom

* 1. What was his main contribution to computer science?
* The Analytical Engine which is basically an updated version of the Difference Engine served a purpose to calculate and solve many problems because of its logical variation and flexibility.
* Developed the first algorithm to be processed by a machine.
* Helped Charles Babbage with his analytical engine.
  1. What is the computer language that is named after her?

The Ada Computer language.

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

The analytical engine was a programmable, mechanical, multi-purpose computer device.

It was an updated version of the Difference Engine which serves a purpose to calculate and solve many problems because of its logical variation and flexibility.

* 1. How did it work?

The machine was programmed using punch cards. The machine would've been able to do numerous calculations as well as store a limited number of variables.

Three types of cards would've been used to control the machine: operation cards, number cards and variable cards. Operation cards would execute arithmetic operations and branching/looping functions. Number cards would load a numerical constant in to the store (memory) and variable cards would transfer values from the store part of the analytical engine to the Mill part that executes operations.

* 1. How was it similar to modern computers?

Years before the first modern computers were created, there were people who already programmed inputs in assembly using the analytical engine’s wired hardware. Now computers are still taking in our inputs through software and is providing an output somehow through a display screen (software as well). ( The modern era made this process more simplified and less hands on as we are now more prone to the use of having computer software to do many functions than seeing an input and output based on hardware calibration).

**Level 2: Alan Turing**

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

Born on June 23, 1912 in Maida Vale

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

During World War 2, the industries of early technology saw a new era with people like Alan Turing who are pioneers for their code-breaking efforts during the mid-20th century. Turing is most credited for solving a telecommunication system known as the Enigma.

* 1. What were his main contributions to computer science after World War II?
* He devised the Turing machine and the Turing test of computer intelligence that would still prove relevance to computer systems today
* He continued his work in quantum physics and in cryptanalytics
* He worked on a standard for machines to be called intelligent. The same principle is used today in online CAPTCHA tests, which determine whether a user is a person or a machine.

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 used in machines that were electro-mechanical and were used to protect the German’s communication. Enigma allowed an operator to type in a message, then scramble it by using three to five notched wheels, or rotors, which displayed different letters of the alphabet. The receiver needed to know the exact settings of these rotors in order to understand the coded text. They were transmitted to the Nazi forces using Morse code.

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

It was used by Britain's codebreakers as a way of deciphering German signals traffic during World War Two. It was used to encrypt highly classified messages, which were then transmitted to the Nazi forces.

* 1. How did Alan Turing solve the puzzle?

Turing designed a code breaking machine called the Bombe, which helped decode thousands of messages per day. Turing figured out that a letter can be encrypted as any letter other than itself in which the total number of possible settings in the Enigma decreased.

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

Turing was meant to disclose everything he and his team at Bletchley Park knew about the workings of Enigma. Although, he was under strict instructions from the MI6 to keep the Americans away from it. So Britain was deciphering messages to and from the German U-boat fleet since the summer of 1940 which had been unknown to the Americans.

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.

* Turing broke the German Enigma Code during the Second World War which played a huge role in the British advantage over the Germans
* His device called the bombe which was code breaking machine had estimated to have shortened the war in Europe by two to four 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?

Turing was prosecuted for being gay in which at the time was taken as a foolish act of crime. During the time, people were abused and harassed for their personal beliefs of being gay. It is believed that homosexuality existed years later in Europe, meaning that during these years, it was not recognized with much respect at all and was taken as a societal impact.

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

Alan Turing had to undergo chemical castration because he was gay. As Turing admitted that he had a sexual relationship. At that time homosexual acts were illegal in the United Kingdom. He was given a choice between imprisonment and probation, on the condition that he underwent hormonal treatment designed to reduce chemical castration. Turing accepted the treatment, which went on for a year turning him impotent and caused gynecomastia.

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

He committed suicide with cyanide poisoning. Although it was more probably accidental as claimed from the bitten apple that was found as evidence.

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.

* Turing showed a high level in Mathematics. Like at the age of 14 he could solve advanced problems without studying in elementary calculus
* He was involved in the early development of Artificial Intelligence. As he designed an experiment which is nowadays known as the Turing test.
* He came up with the idea of a machine that was able to compute anything that could be computed. This was known as the Turing Machine and led to the modern computer.
* In 1952, he developed a Chess program for a computer that did not yet exist. Having no computer powerful enough to run the program, Alan played a game in which he simulated the computer

It is always questioned how much further ahead computing would have been, if he had lived.

**Quotes from Turing:**

"A computer would deserve to be called intelligent if it could deceive a human into believing that it was human."

"We can only see a short distance ahead, but we can see plenty there that needs to be done."

**Level 3: Other Great Contributors**

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

Born on December 28, 1903 in Budapest, Hungary

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

In 1933, he became a mathematics professor at the Institute for Advanced Study in Princeton, New Jersey and he kept this position until his death.

* 1. What was his contribution to mathematics & science?
* From 1926 to 1930 he taught at the University of Berlin
* By 1922 he had published two major papers on mathematics which included the modern definition of ordinal numbers.
* In one of his books he introduced cellular automata, which is a model that describes a wide range of phenomena like the interaction of genes or the development of multicellular organisms.
* HIs dissertation was on the axiom of foundation and his method of inner models became an essential element in theories.
* He found continuous geometry and discovered von Neumann algebras
  1. What was his contribution to computer science?
* Neumann had a study which demonstrated that a computer could have a simple, fixed structure, that is able to execute any kind of computing given properly programmed control without the need for hardware modifications.
* Neumann contributed a new understanding of how fast computers should be organized and built. These are referred to as the stored-program technique
* The von Neumann architecture is a design model for a program stored in a computer that uses a processing unit and a single separate storage structure to hold both instructions and data.

1. What was the "ENIAC" computer and the "von Neumann Machine"?

The Electronic Numerical Integrator And Computer (ENIAC) was needed by the United States Army's Ballistic Research Laboratory for the calculation of artillery firing tables.

The von Neumann Machine came from the design model for a program stored in a computer that uses a processing unit and a single separate storage structure to hold both instructions and data.

They were programmed by setting switches and inserting patch leads to route data and to control signals between various functional units.

A similar understanding of memory transfer is used for both data and program instructions in modern systems.

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

Born on December 9, 1906 in New York City, USA

* 1. What were some of her contributions to computer science?
* Credited as coining the term "bug"
* Extended the meaning of debug
* Lead the team that invented COBOL
* Part of the team that helped develop the UNIVAC I

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(Common Business-Oriented Language) is a programming language that reads like regular English. While as other languages such as Java, Python or C++ are complex in the way the language structure is inputted and oriented.

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

Yes as it is a simple language defined for less complexity and that is why financial areas like businesses such as banks will still use COBOL based applications in the programming of their databases.

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

Born on June 8, 1955 in London, England

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

He was knighted for his services in the global development of the Internet through his invention of the World Wide Web, which was praised even during its early start as a system to organize, link, and browse Internet pages.

* 1. What is his contribution to computer science?
* He created the World Wide Web in which allowed for websites as we know today to exist.
* He proposed hypertext (a function within applications that links topics on the screen to related information or graphic)
* Through 1991 and 1993, Tim continued working on the design of the Web, getting feedback from users across the Internet. To refine the specifications of the URIs, HTTP and HTML
* In November 2009, he created the World Wide Web Foundation whose purpose was to Advance the Web to empower humanity by launching programs that build for positive change

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

I probably would have not been capable of typing this assignment currently and would have instead be handwriting it on paper.

The way we communicate, obtain the news, and make other uses for the purpose of our own personal entertainment and needs would have not seen drastic change like the way it is simply available on all forms of modern computer devices today.