

## W14B: DE [Enigma] Applications- Imitation Games

### Introduction

### Digital Electronics Applications/Math

### Enigma Machine

### Problem-Solving

### Procedure



1. Write a summary of the movie in at least three paragraphs. How did they use the design process to solve the problem? Why is teamwork important in coming up with a solution? How was Digital Electronics used so win the war?

Write the answers to the questions in essay format. Make sure to give details information.

During World War II, the Germans used a cipher device named the Enigma machine to encode military communications. This machine used a series of rotating rotors and electrical circuits to scramble the letters into complex codes, changing the encryption daily. The allies couldn't crack it through brute force, there were over 150 quintillion possible settings. Alan Turing, a British mathematician, alongside a group of cryptanalysts at Bletchley Park were tasked with finding a way to break Enigma without needing to manually check every setting. Instead of decoding by hand, they decided to design a machine that could simulate the possible rotor settings much faster.

The team used aspects of the engineering design process to develop a solution, firstly, they addressed their problem: Enigma was too complex to solve with traditional methods. Then they brainstormed potential solutions strategies and evaluated their feasibility. Turing's idea to build a machine was selected. They built prototypes, tested their logic against intercepted messages, and iterated on the machine's design. By automating parts of the decryption process, they drastically cut down the time it took to crack German codes, sometimes breaking messages within hours. Without this methodical problem-solving process, success would have been impossible.

Teamwork was absolutely crucial. Each person brought different strengths to the project. Turing had mathematical genius, others contributed engineering, linguistic, and organizational skills. Together, they intercepted messages, maintained the Bombe machine, and interpreted results. This was a very early use of digital electronics in warfare, Turing's machine relied on electromechanical logic, a precursor to the digital circuits we use and make today. These machines used switches, relays, and logical decision making to simulate the Enigma's process. The success at Bletchley Park shortened the war by an estimated two years, saving millions of lives, and laying the groundwork for modern computing.

2. From Avatar where are they heading to provide Katara training for her water bending?

Explain in detail.

In Avatar, the gang went to the Northern Water Tribe so Katara could receive formal training in waterbending, previously being self-taught. The Northern Water Tribe, located at the North Pole, is home to skilled waterbending masters and a massive, hidden ice city built into the polar landscape. In much contrast to Katara's home, the Southern Water tribe, which was desecrated by the Fire Nation during the Hundred year war, with nearly all of the master water benders being killed or imprisoned.