

## READING CHALLENGE

# The Enigma Code

*How a brilliant mathematician helped win World War II by breaking an 'unbreakable' code*

<b>Level</b>	B1 (Intermediate)
<b>Age Group</b>	Teens (11-16)
<b>Topic</b>	True Stories
<b>Duration</b>	~20 minutes
<b>Skill</b>	Reading

In the summer of 1939, Europe was on the edge of war. Adolf Hitler's Germany had already invaded Czechoslovakia and was preparing to attack Poland. The British government knew that war was coming, and they also knew that winning it would depend on one thing above all else: information. If Britain could read Germany's secret military messages, it would have an enormous advantage. But there was a problem. The Germans were using a coding machine so **complicated** that they believed nobody could ever crack it. They called it Enigma — a word that means "puzzle" or "mystery." Breaking this code would become one of the greatest **intelligence** achievements in history, and the man who led the effort was a shy, awkward, **genius** mathematician named Alan Turing.

## The Enigma Machine

The Enigma machine looked like a typewriter in a wooden box. It had a keyboard, a set of lights (called a lampboard), and — most importantly — a series of spinning wheels called rotors. When an operator typed a letter, the electrical signal passed through the rotors, which scrambled it into a completely different letter. The light on the lampboard would show the new, coded letter. The clever part was that every time a key was pressed, the rotors moved to a new position. This meant that if you typed the letter "A" twice, it would produce two different coded letters each time. The machine had three rotors chosen from a set of five, a plugboard that swapped pairs of letters, and various other settings. Together, these created an almost unbelievable number of possible combinations. Mathematicians later worked out that the Enigma machine had approximately 159 million million million possible settings for each day. To put this in perspective, if you tried one setting every second, it would take longer than the age of the universe to try them all. The Germans were confident: Enigma was unbreakable.

## Bletchley Park

The British government had other ideas. In August 1938, a year before the war even started, they began secretly recruiting the country's best minds. They brought together mathematicians, chess champions, crossword puzzle experts, linguists, and even a few eccentric professors. Their **headquarters** was a Victorian mansion called Bletchley Park, located about 80 kilometres north-west of London in the quiet countryside of Buckinghamshire. Everything about Bletchley Park was **classified**. The people who worked there could not tell their families, their friends, or even their husbands and wives what they did. They signed the Official Secrets Act and were warned that revealing any information could result in imprisonment or worse. At its peak, around 10,000 people worked at Bletchley Park. Many of them were women — about 75 percent of the workforce. They operated machines, translated messages, and performed countless **crucial** tasks. Without their effort, the codebreaking operation would have been impossible.

## Alan Turing Arrives

Alan Turing arrived at Bletchley Park on 4 September 1939, the day after Britain declared war on Germany. He was twenty-seven years old. Turing was already known in the academic world for a groundbreaking paper he had written in 1936, in which he described a theoretical machine that could solve any mathematical problem — an idea that would later become the

basis for modern computers. But at Bletchley Park, Turing faced a very practical challenge. The Germans changed the Enigma settings every single day at midnight. This meant that even if the codebreakers managed to find the correct settings for one day, they would have to start again from zero the next morning. They needed a way to **decrypt** the messages quickly — within hours, not days. Turing realised that no human team could **calculate** fast enough. He needed to build a machine that could do it.

## The Bombe

Turing designed an electromechanical device called the Bombe. The name came from a Polish codebreaking machine called the "Bomba" — Polish mathematicians had actually made the first important progress on Enigma before the war and had shared their work with Britain and France in July 1939. Turing's Bombe was far more advanced. It was about two metres tall and two metres wide, and it contained dozens of spinning drum-like wheels that imitated the rotors of the Enigma machine. The Bombe worked by testing thousands of possible settings at high speed. It did not try every single combination — that would have taken far too long. Instead, Turing used a clever mathematical technique. The codebreakers would look for "cribs" — words or phrases they expected to find in the German messages. For example, many German messages began with a weather report, so words like "WETTER" (weather) were common. The Bombe would use these cribs to eliminate impossible settings and narrow down the possibilities. When the Bombe found a likely setting, a human operator would test it. If the message made sense in German, they had cracked that day's code. The first Bombe, called "Victory," began working in March 1940. By the end of the war, there were over 200 Bombes operating around the clock. The **breakthrough** was extraordinary. For the first time, the Allies could regularly **intercept** and read German military communications.

## Turning the Tide of War

The impact of breaking Enigma was enormous. In the Battle of the Atlantic, German submarines — called U-boats — were sinking hundreds of Allied supply ships. Britain, an island nation, depended on supplies from North America. If the U-boats cut off these supplies, Britain would starve. By reading the Enigma messages, the codebreakers at Bletchley Park could tell the Royal Navy exactly where the U-boats were hiding. Convoy routes were changed to avoid the submarines. Ships that were **vulnerable** were given extra protection. The losses dropped dramatically. The intelligence from Bletchley Park, known by the codename "Ultra," was also vital for the D-Day landings on 6 June 1944. The Allies knew the positions of German troops, their supply lines, and even some of their battle plans. General Dwight D. Eisenhower, the Supreme Allied Commander, later said that Ultra was "decisive" in winning the war. Historians **estimate** that the work at Bletchley Park shortened the war by at least two years. Some experts believe it may have been even more — perhaps three or four years. This means that breaking Enigma saved an estimated 14 to 21 million lives. It is almost impossible to imagine a greater **contribution** from a group of people working in secret in the English countryside.

## The Tragedy of Alan Turing

After the war ended in 1945, the people of Bletchley Park went home. They could not talk about what they had done — the entire operation remained classified for decades. Turing continued his academic career. He worked at the National Physical Laboratory and then at the University of Manchester, where he helped develop some of the earliest electronic computers. He also wrote an important paper in 1950 called "Computing Machinery and Intelligence," in which he asked whether machines could think. He proposed a test — now called the Turing Test — to measure machine intelligence. But Turing's personal life brought him great suffering. In 1952, he was arrested and prosecuted for being homosexual. At that time, homosexuality was illegal in Britain. Turing was found guilty and given a terrible choice: go to prison or accept chemical castration — injections of hormones that would change his body. He chose the injections. The treatment caused him physical and emotional pain. He lost his security clearance, which meant he could no longer work on **classified** projects. The **persecution** was devastating for a man who had done so much for his country. On 7 June 1954, Alan Turing was found dead at his home in Wilmslow, Cheshire. He was forty-one years old. An apple with a few bites taken from it was found beside his bed. The official cause of death was cyanide poisoning. Most people believe it was suicide, although some historians have questioned this.

## Recognition at Last

For decades, Turing's wartime work remained secret. The files about Bletchley Park were not made public until the mid-1970s, and the full story took even longer to emerge. Slowly, the world began to understand just how important Turing's **contribution** had been. In 2009, British Prime Minister Gordon Brown issued an official public apology for the way Turing had been treated. He called it "appalling." In 2013, Queen Elizabeth II granted Turing a royal pardon. And in 2021, the Bank of England put Turing's face on the new 50-pound note, making him the first openly gay person to appear on a British banknote. Today, Alan Turing is recognised as one of the most important figures of the twentieth century. He is considered the father of computer science and artificial intelligence. The Turing Award, given every year by the Association for Computing Machinery, is often called "the Nobel Prize of computing." Bletchley Park itself has been turned into a museum, where visitors can see the original huts, a working replica of the Bombe machine, and learn about the thousands of men and women who worked there in secret. The story of Enigma reminds us that wars are not only won on battlefields. Sometimes, the most important weapon is a brilliant mind. And sometimes, the heroes who save millions of lives are the ones nobody knows about — at least, not until it is far too late to thank them properly.

## The German Side

One of the most remarkable things about the Enigma story is that the Germans never realised their code had been broken. Throughout the entire war, they continued to trust their machine completely. When things went wrong — when a convoy was attacked or a submarine was found — they blamed spies, bad luck, or traitors. They never seriously considered the possibility that someone was reading their messages. The Allies worked very hard to keep this secret. They could not act on every piece of **intelligence** they received, because if they did, the Germans might become suspicious. Sometimes, this meant allowing

attacks to happen even when they knew they were coming. It was an agonising decision, but it was necessary to protect the secret of Ultra. Even after Germany's [surrender](#) in May 1945, many senior German military officers refused to believe that Enigma had been cracked. The idea that their "perfect" machine had been defeated by a group of mathematicians and crossword enthusiasts in a country house was simply too hard to accept.

## Vocabulary

Term	Definition
<b>intercept</b>	to catch or stop something before it reaches its destination
<b>decrypt</b>	to change a coded message back into normal language
<b>classified</b>	officially secret, especially relating to government or military information
<b>genius</b>	an exceptionally intelligent or creative person
<b>breakthrough</b>	an important discovery or achievement that comes after a lot of hard work
<b>calculate</b>	to work out a number or answer using mathematics
<b>intelligence</b>	secret information collected about an enemy or a foreign country
<b>surrender</b>	to stop fighting and accept that you have lost
<b>crucial</b>	extremely important; necessary for success
<b>complicated</b>	consisting of many connected parts; difficult to understand
<b>estimate</b>	to make a rough guess about a number, amount, or value
<b>vulnerable</b>	able to be easily hurt, harmed, or attacked
<b>contribution</b>	something that you do or give to help achieve something
<b>headquarters</b>	the main office or centre of an organisation
<b>persecution</b>	cruel and unfair treatment of a person or group, especially because of their race, religion, or beliefs

## Comprehension Quiz

**1. How many possible settings did the Enigma machine have each day?**

- A) About one million
- B) About one billion
- C) About 159 million million million
- D) About 15 million

**2. What was the name of the machine Alan Turing built to help break Enigma?**

- A) The Calculator
- B) The Colossus
- C) The Decoder
- D) The Bombe

**3. How did breaking the Enigma code help in the Battle of the Atlantic?**

- A) It allowed the Allies to build faster ships
- B) It helped the Allies locate and avoid German U-boat submarines
- C) It helped the British recruit more sailors
- D) It allowed the Allies to destroy all German submarines at once

**4. What happened to Alan Turing after the war because of his personal life?**

- A) He was given a medal by the King
- B) He was promoted to general in the army
- C) He was prosecuted for being homosexual and given chemical treatment
- D) He was sent to work in the United States

**5. Why did nobody know about Turing's wartime work for decades?**

- A) He never told anyone what he did
- B) The work at Bletchley Park remained classified until the 1970s
- C) All records were destroyed after the war
- D) The government denied Bletchley Park ever existed

## Answer Key

#	Answer	Question
1	C	How many possible settings did the Enigma machine have each day?
2	D	What was the name of the machine Alan Turing built to help break Enigma?
3	B	How did breaking the Enigma code help in the Battle of the Atlantic?
4	C	What happened to Alan Turing after the war because of his personal life?
5	B	Why did nobody know about Turing's wartime work for decades?