

Alan Turing and Enigma – April 27, 2015

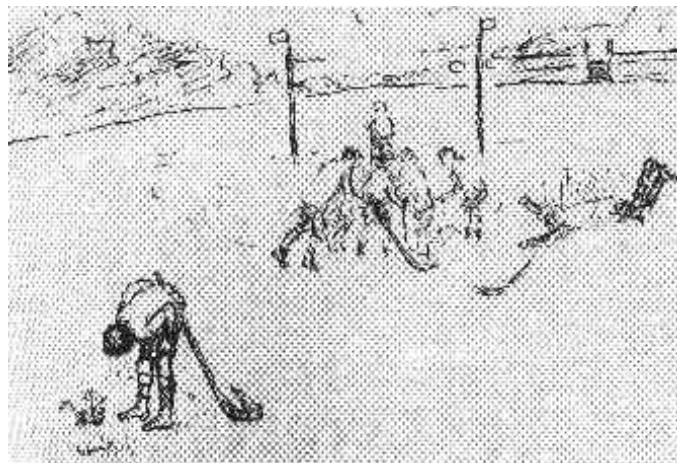


Photo Credit: <http://www.alanturing.net/>

Alan Turing was a mathematician, cryptographer and computer science pioneer. He was born the 23rd of June, 1912 in England and died in 1954. In addition to his work as a mathematician, he is best known today as the codebreaker of the Enigma cipher machine. Enigma was used by Germany during World War II to communicate secret messages.

Interesting Facts about Alan Turing:

1. He liked to run, joined running clubs and competed at events in Britain. He finished 5th at the 1948 British National Marathon in 2 hours 46 minutes. Only 11 minutes slower than the winning time at the Olympics the same year.
2. He borrowed *Alice's Adventures in Wonderland* and *Through the Looking Glass, and What Alice Found There* by Lewis Carroll from his school library.
3. His father requested that Alan be allowed to substitute golf instead of playing cricket, so that he would have the opportunity to walk and think out problems.
4. He also studied physics, quantum mechanics, biology, chemistry and neurology.
5. He was fascinated by daisies (See the sketch, below, of Alan Turing watching a daisy grow during a field hockey game.) Due to his fascination with biology, he developed morphogenesis, a new field in mathematical biology, or an explanation of how things grow. He wrote a paper titled, "Outline of the Development of the Daisy."



Let's get started!

There is a lot of information about **Alan Turing** and the **Enigma** cipher machine. We have selected a couple of websites and video clips to help your students learn more. Ask your students to answer the questions based on their level of experience. All options are worth **6 points**.

Alan Turing

- Webpages-
 - Classroom Activity: Alan Turing – School Student, <http://spartacus-educational.com/EX2WU3.htm>.
 - What Did Turing Do for Us? – <http://nrch.maths.org/8050/index?nomenu=1>
 - The Alan Turing Internet Scrapbook, Critical Cryptanalysis: The Enigma War, 1939-1942, <http://www.turing.org.uk/scrapbook/ww2.html>

- Alan Turing, *Spartacus Educational*, https://spartacus-educational.com/Alan_Turing.htm
- Video Clips-
 - Alan Turing, <https://www.youtube.com/watch?v=AgW6HplOZV0>**Enigma Cipher Machine**

Enigma Cipher Machine

- Webpages-
 - The Enigma Machine: How the Alan Turing Helped Break the Unbreakable Nazi Code, *Open Culture*,
http://www.openculture.com/2013/01/the_enigma_machine_how_alan_turing_helped_break_the_unbreakable_nazi_code.html
 - The Enigma Machine, http://spartacus-educational.com/Enigma_Machine.htm
- Video Clips
 - 158,962,555,217,826,360,000 (Enigma Machine) – Numberphile,
https://www.youtube.com/watch?v=G2_Q9FoD-oQ
- Additional resources can be found at the bottom of the page.

Beginner –

1. What was the name of the hypothetical computer invented by Alan Turing? (Hint: it starts with a “T”)
2. How long did it take for Alan Turing to teach himself how to read?
3. What was the name of the British machine that broke the Enigma code?
4. How many years was the British machine kept secret?
5. In the German military Enigma machine, how many combinations for message encryptions are possible?

Intermediate/Advanced –

1. Answer the Beginner questions above.
2. Alan Turing was recruited as a codebreaker to work at the British Government Code and Cypher School in September 1939. What was the purpose of the codebreakers during World War II?
3. Describe, in your own words, how the British machine broke the Enigma code? What was the “fatal flaw”?
4. What is the Turing Test?

How to earn points:

- 1) If you haven't registered your class, please go to cs.montana.edu/looney-challenge and click on the “Register for Looney Challenges” link.
- 2) Discuss with your class the difficulty of the activity. What did they learn? How difficult was the activity? Do they understand the concept?
- 3) Briefly, in a couple of sentences, describe in your email what happened during the activity? Did your students understand the concept(s)? Email your description to looneychallenges@gmail.com
- 4) If you want to attach an example, photographs of students working, or video of student's outcomes, please send them as an attachment.
- 5) We will send you a confirmation and provide you your point total for the activity and your total points for Looney Challenges.

All Looney Challenges can be completed at any time during the 2015-2016 school year. All Challenges are due, June 30, 2016.

Questions? Please send an email to looneychallenges@gmail.com or call Sharlyn Izurieta at (406) 994-4794.

DEADLINE is June 30th, 2015.

Additional Reading and video clips:

- Webpages-
 - Alan Turing: Father of the Modern Computer, by B. Jack Copeland and Diane Proudfoot, *Rutherford Journal*, <http://www.rutherfordjournal.org/article040101.html>
 - Alan Turing, Enigma and the Breaking of the German Machine Ciphers in World War II, <http://www.archives.gov/publications/prologue/1997/fall/turing.pdf>
- Video Clips –
 - Flaw in the Enigma Code – Numberphile, <https://www.youtube.com/watch?v=V4V2bpZlqx8>
 - The Men Who Cracked Enigma, <https://www.youtube.com/watch?v=eoK4i0SU3DA> (23 minutes)

Additional References:

1. *The Other New Movie about a Famous Runner*, Runners World, <http://www.runnersworld.com/general-interest/the-other-new-movie-about-a-famous-runner> (December, 2014).
2. *Alan Turing.net: The Turing Archive for the History of Computing*, <http://www.alanturing.net/>.
3. *8 Things You Didn't Know about Alan Turing*, PBS NewsHour, by Rebecca Jacobson, <http://www.pbs.org/newshour/updates/8-things-didnt-know-alan-turing/>
4. *Alan Turing: A Brief Biography*, http://www.emcp.com/intro_pc/reading2.html.
5. *Alan Turing*, Biography.com, <http://www.biography.com/people/alan-turing-9512017>