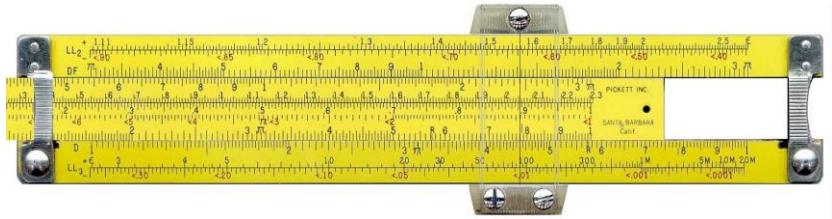
# 8.1 HISTORY OF COMPUTERS


# What is a computer?

The first use of the word ***computer***:

- The term computer was originally a job role.
- The first computers were actually people (usually women) who did **'computation'** on paper using slide rules.



- Most of the early calculations were for mathematical tables, bomb trajectories and rocketry calculations.

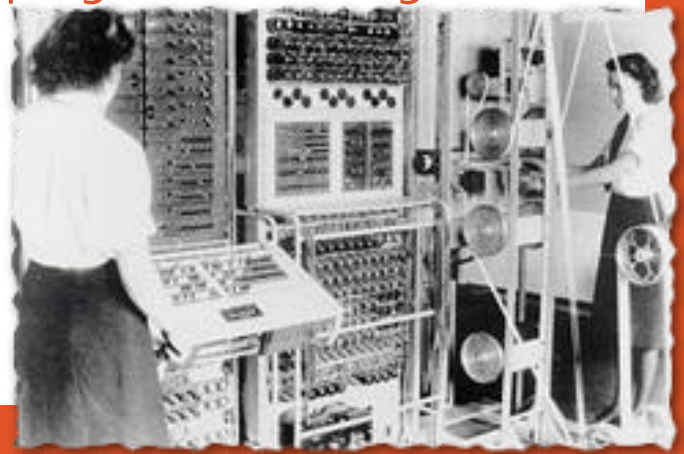
# What is a computer?

**Recap**

- Video http://hoc.lgfl.org.uk/resource.html#
  - KS2 resources (What is a computer)

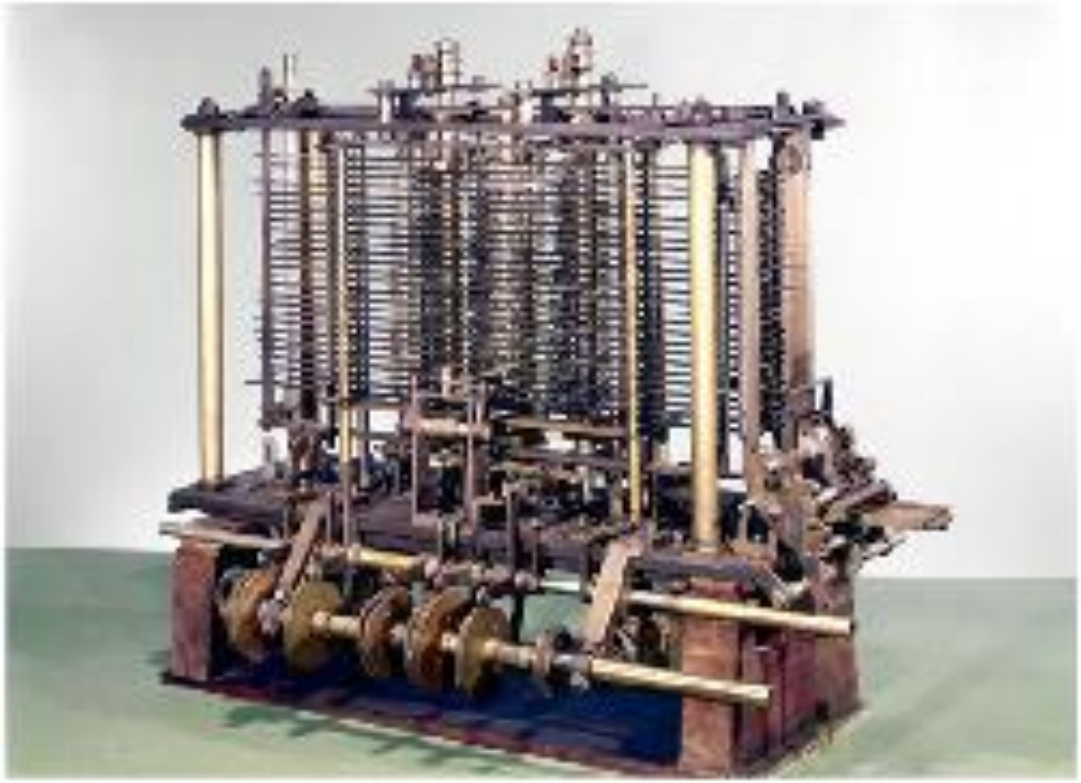
- The worlds first programmable, electronic, digital computer, ***Colossus***, was developed by the British codebreaker Tommy Flowers during the later part of the Second World War to help in the 'cryptanalysis' (codebreaking) of the Lorenz cipher.

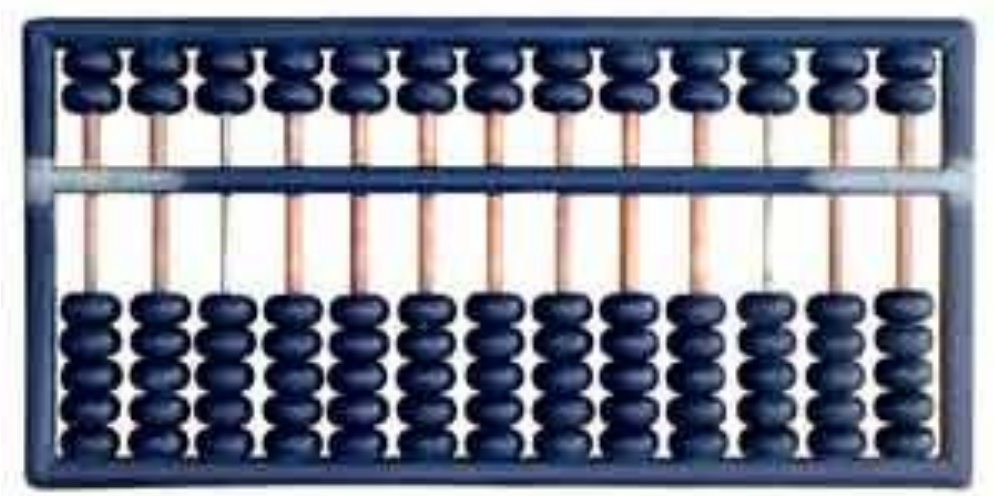
- Colossus used vacuum tubes to perform logic and counting operations and was programmed using switches and plugs and not by a programmer typing at a keyboard.



- ***DON'T WORRY, we will cover this later on……***

# What do these two things have in common?





# What you will learn

**All of you will:**

- Identify a few key points in the development of computers.

**Most of you will:**

- Identify key people and explain what they did to help in the development of computers.
- Put key events into the correct order in which they happened.

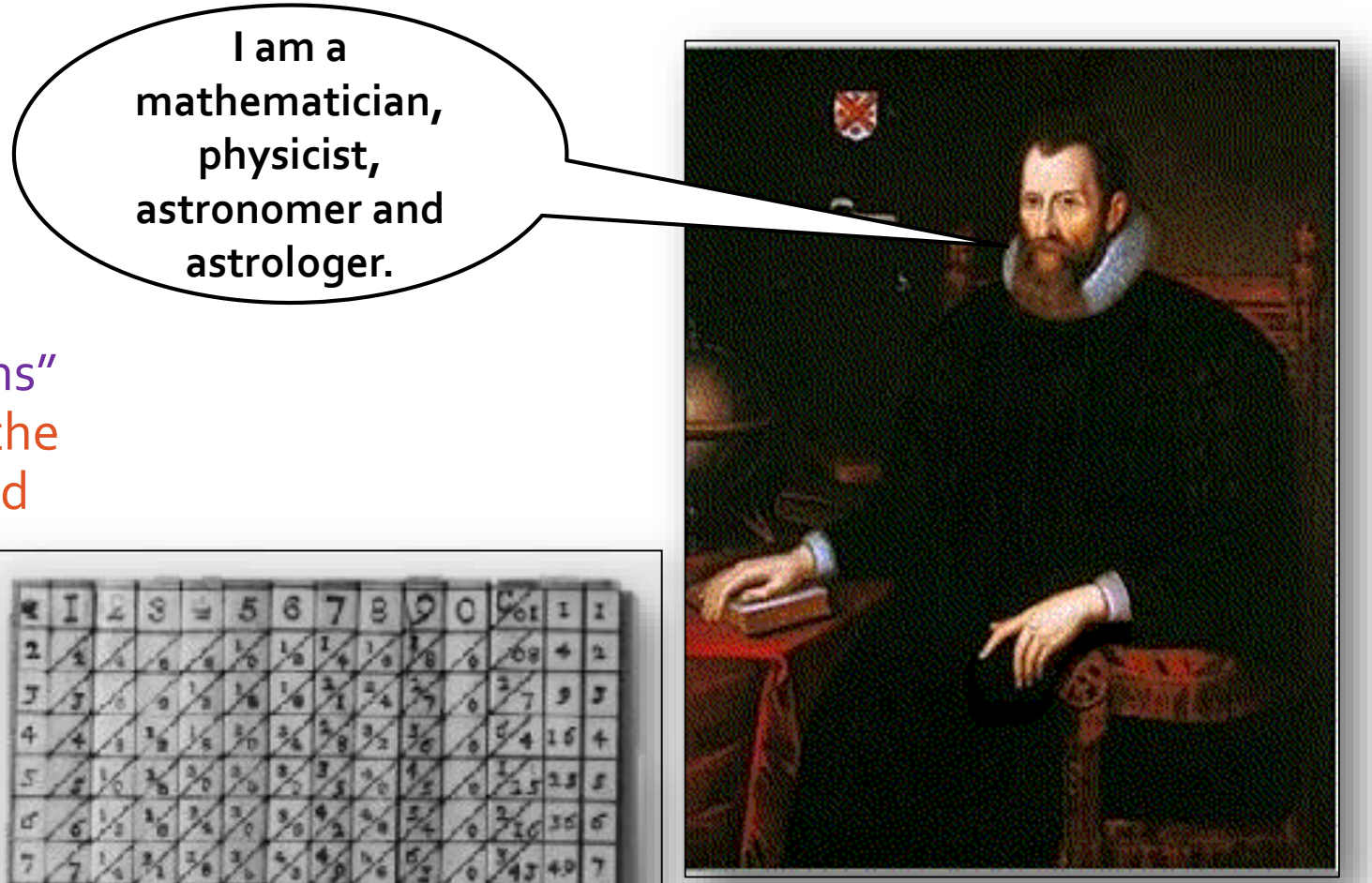
**Some of you will:**

- Create a poster to show some of the key points in computer history.

# Over 5000 years ago…

- The abacus was used in Babylon 2000 years before the Greeks used it to help with calculating.
- To use it, you slide the beads up and down on the rods to add and subtract.
- It is still used today in some countries.

# John Napier

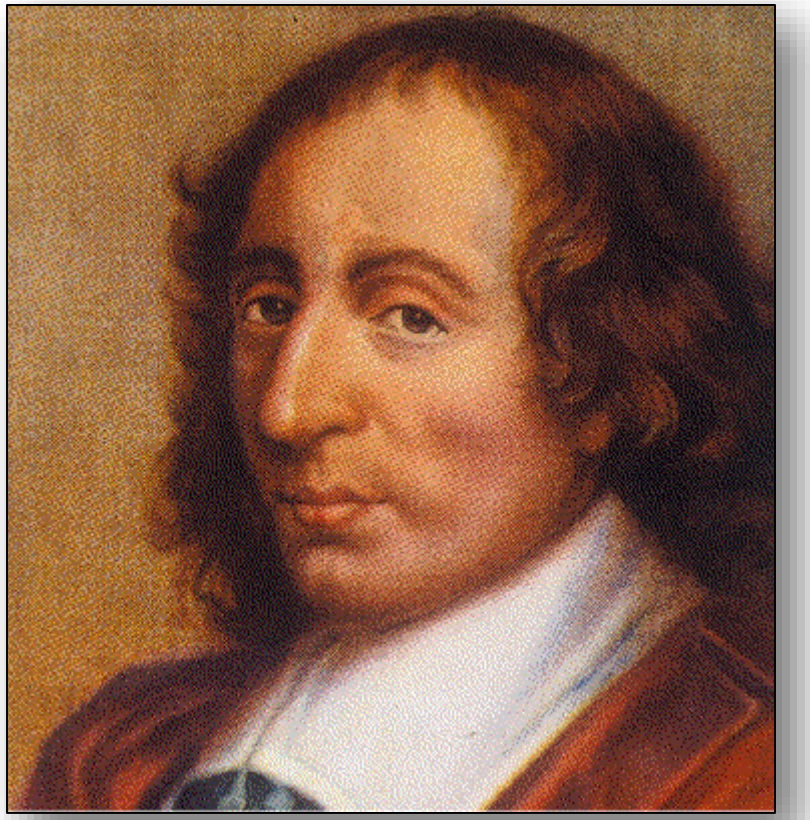



- John Napier invented "logarithms" which use lookup tables to find the solution to otherwise tedious and error-prone mathematical calculations.

# Blaise Pascal

- This famous French philosopher and mathematician invented the first calculator in 1645 to help with collecting taxes.

- It could add and subtract by rotating dials.

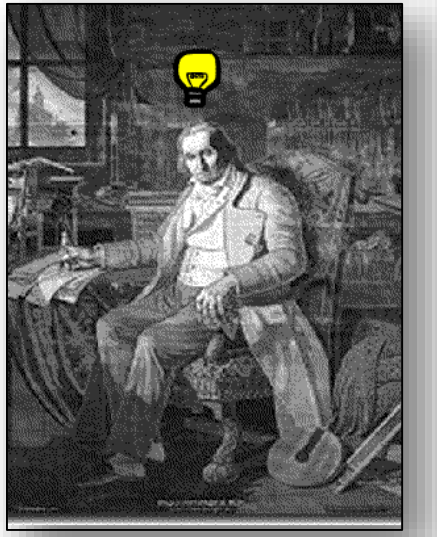


# Gottfried Wilhelm von Leibnitz

- Leibnitz invented a machine in 1674, around 30 years after Pascal invented his machine.
- He called it the "Stepped Reckoner"
- and it could not only add and subtract, but multiply and divide as well.

# Joseph-Marie Jacquard

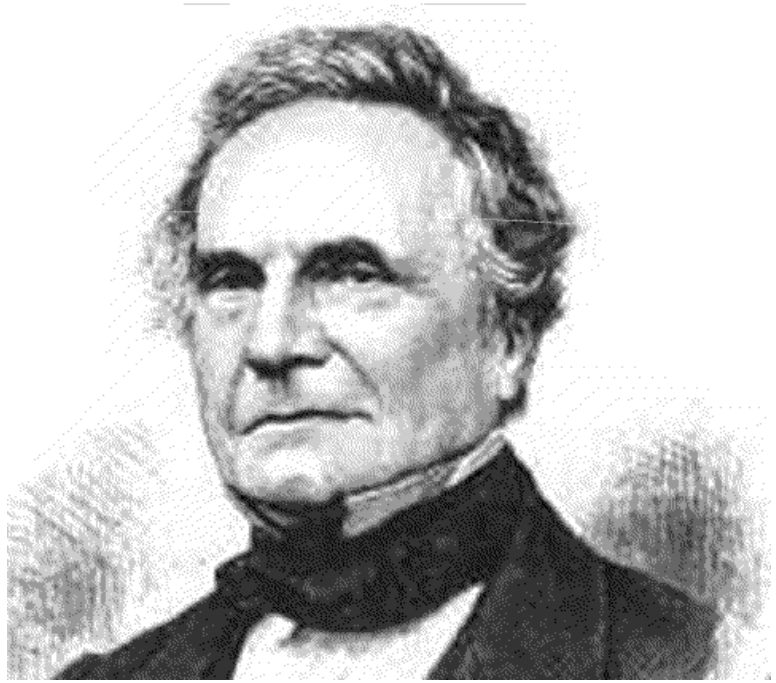
- Joseph-Marie Jacquard was a weaver.
- In 1804, he got the bright idea of adapting the use of punched cards used in musical boxes to control his looms.
- His invention provided a model for the input and output of data in the electro-mechanical and electronic computing industry.



# Charles Babbage

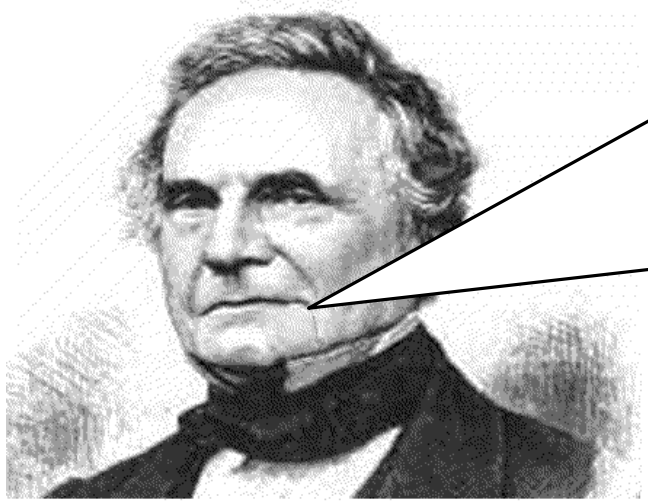
- Charles Babbage designed the "Difference Engine" and "Analytical Engine" in the early 19th Century,

- This was the blueprint used in the invention of the modern electronic digital computer.



# Charles Babbage

- The Difference Engine was never fully built.
- Babbage drew up the plans for it while still a student at Cambridge University.



I also invented the cowcatcher, dynamometer, standard railroad gauge, uniform postal rates, occulting lights for lighthouses, Greenwich time signal, heliograph ophthalmoscope. But I **HATE** street musicians!

# Lady Augusta Ada

- She was the daughter of the famous romantic poet Lord Byron and she was a brilliant mathematician who helped Babbage in his work.
- She documented his work, which Babbage could never bother to do and also wrote programs to be run on Babbage's machines
- She is recognised as the first computer programmer.

# Bletchley Park

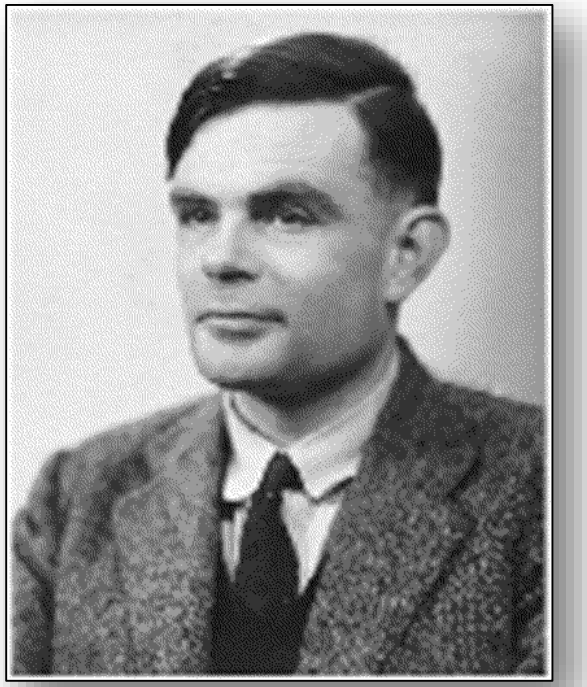
- During World War 2, code breakers used computational analytical models to try and work out what enemy messages meant.

# Bletchley Park

Two young engineers who met there were called…

Tommy Flowers

and

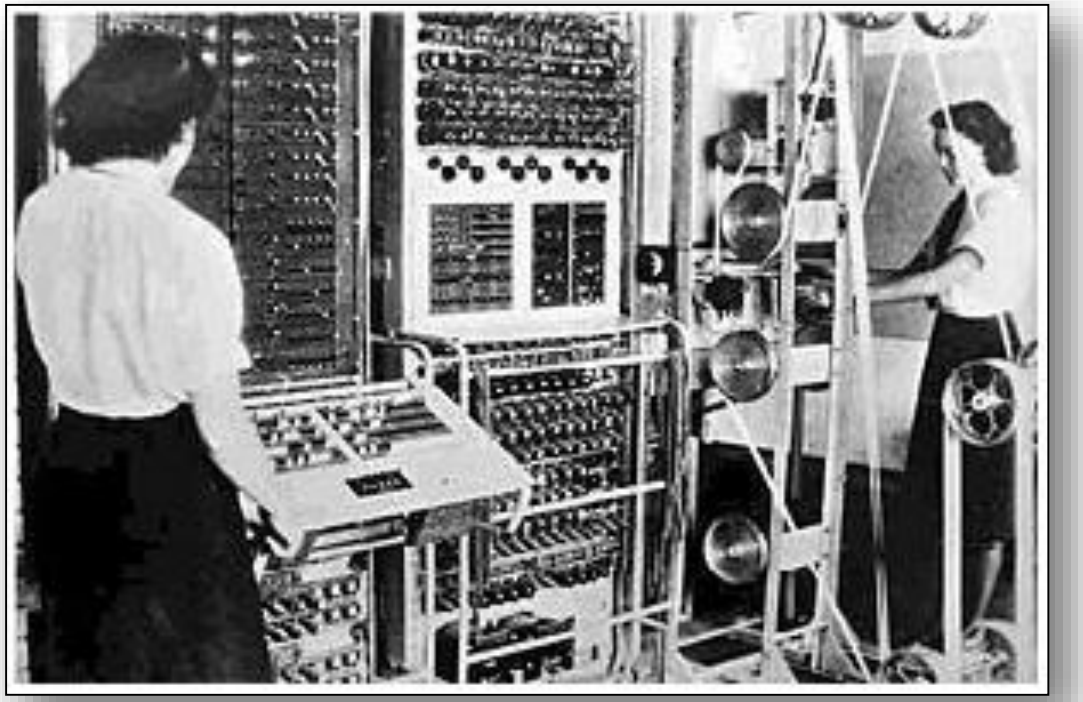


Alan Turing

# Tommy Flowers

- Tommy Flowers invented a computer called Colossus which was the world's first electronic, digital, programmable computer.

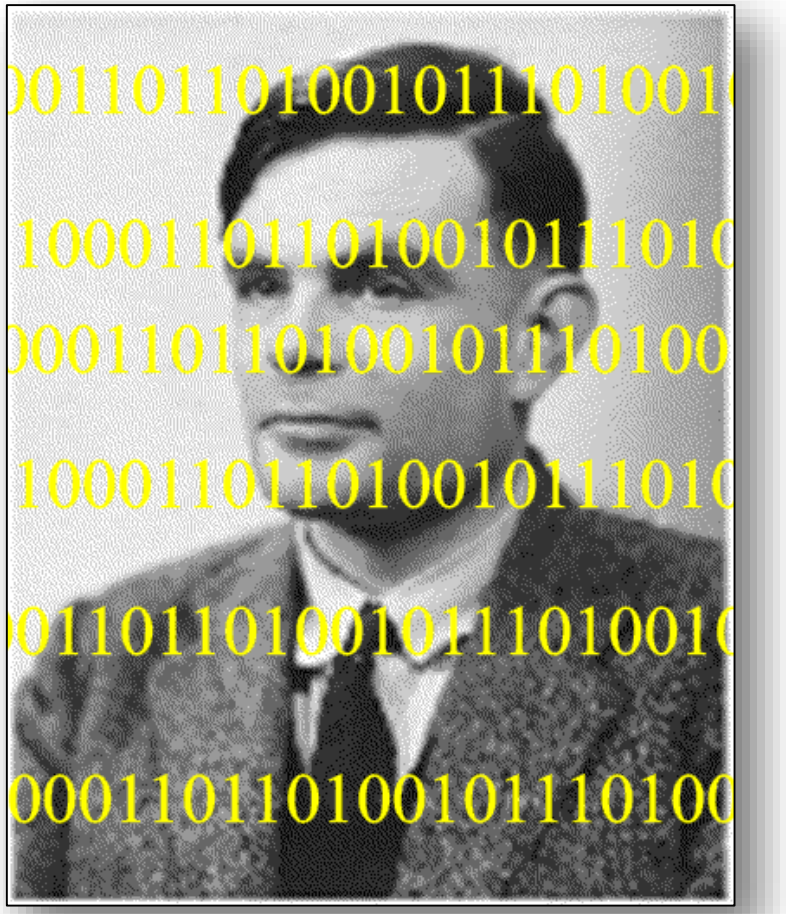
- It was HUGE.



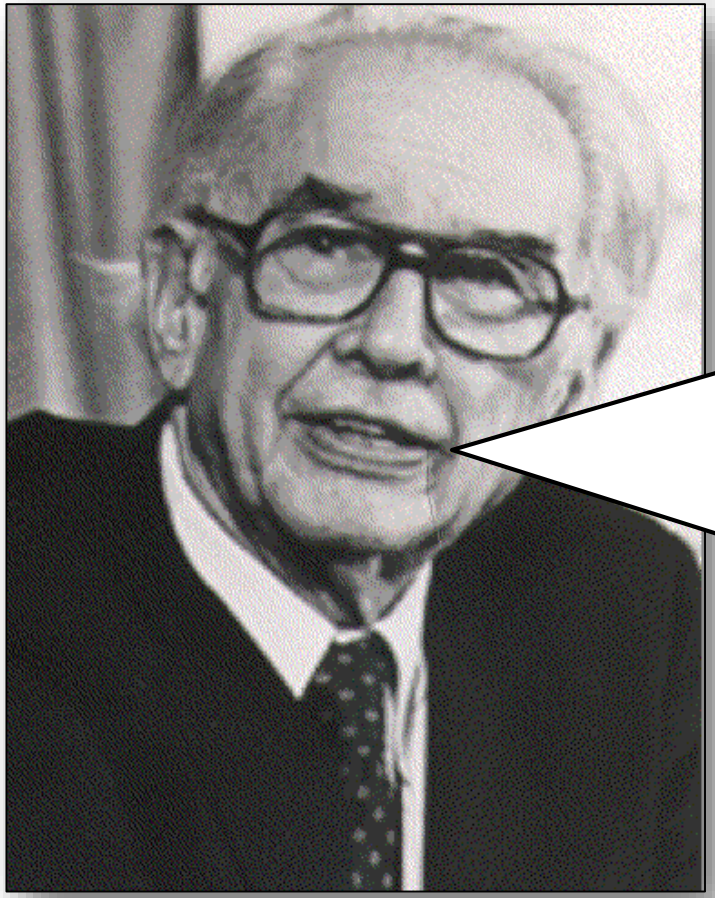
# Alan Turing

- Alan Turing published a paper called On Computable Numbers, with an application to the Entscheidungsproblem.

- The paper proved that a machine capable of processing a stream of 1s and 0s (binary) according to programmed instructions would be capable of solving any problem.



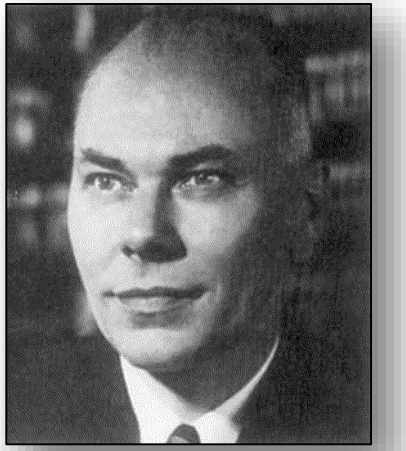
# John Vincent Atanasoff



I invented the ABC, a digital computer, so-called because it processed data using 1s and 0s. Being binary, the data could easily be represented electronically since switches naturally have two states—on and off.

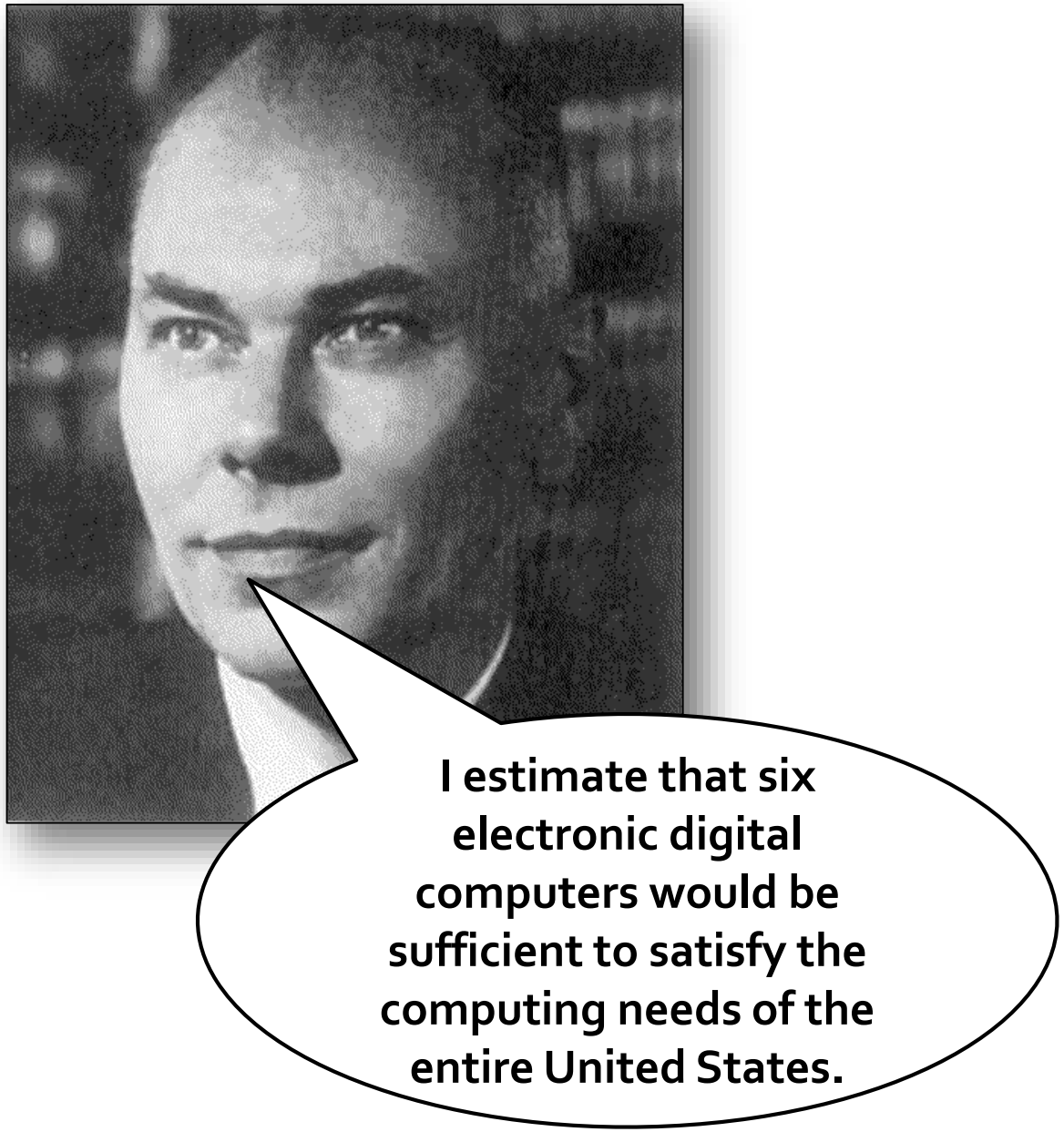
# Howard Aiken

- In 1944, while a professor of physics at Harvard, Howard Aiken was supported by IBM to build the ASCC computer (Automatic Sequence Controlled Calculator).
- The computer had mechanical relays (switches) which flipped backwards and forwards to represent mathematical data.
- It was huge and weighed 35 tons with 500 miles of wiring.



# Howard Aiken

- As computers were so large and were purpose built for each company, they tended to be very expensive.
- Howard Aiken was asked about the future of electronic computers.
- His answer was as follows…



# Dr. Grace Murray Hopper

- Rear Admiral Dr. Grace Murray Hopper, worked with Howard Aiken from 1944
- and used his machine for gunnery and ballistics calculation for the US Bureau of Ordnance's Computation project.

- Dr. Hopper greatly simplified programming by inventing the **"COBOL"** language
- which was the first programming language to use English for variable names and logical operations rather than machine code.

# Dr. Grace Murray Hopper

- She also invented the term "debugging" when a moth flew into the computer and caused an error.

# Valves

- Computers used values which were very big and bulky and tended to overheat and blow up.

- This made them unreliable!!!

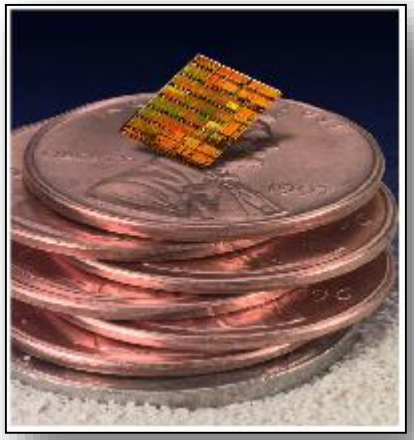
# Jack Kilby

- Jack Kilby invented the first integrated circuit in 1959, which meant computers could become smaller and more reliable.

- These were first used inside calculators.

# Microelectronics Revolution

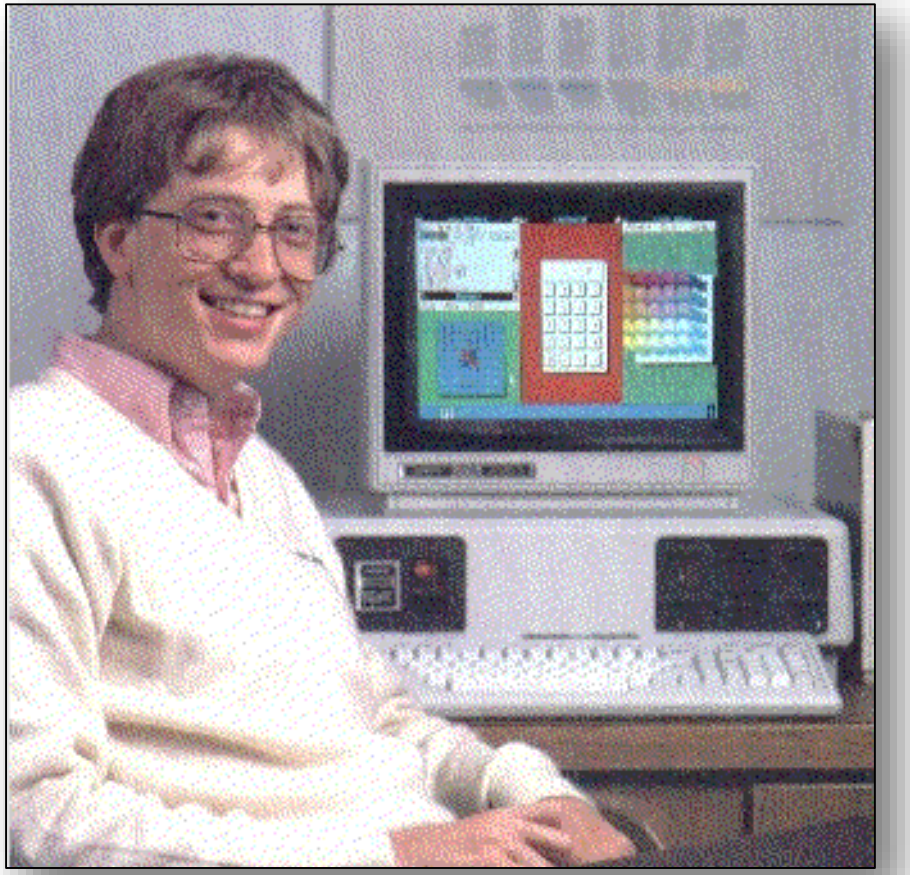
- The microelectronics revolution allowed the amount of hand-crafted wiring seen on the left to be mass-produced as an integrated circuit the size of your thumbnail.



# Bill Gates

- At the age of 13 Bill Gates became interested in programming computers.

- He sold a computer he built and programmed to Seattle to allow them to count their city traffic when he was still a teenager.



# Bill Gates

- Whilst at Harvard University he developed a programming language for his computer.
- He decided to drop out of university so he could concentrate all his time writing programs for his computer
- and started a company called Microsoft to develop software for the newly emerging personal computer market.

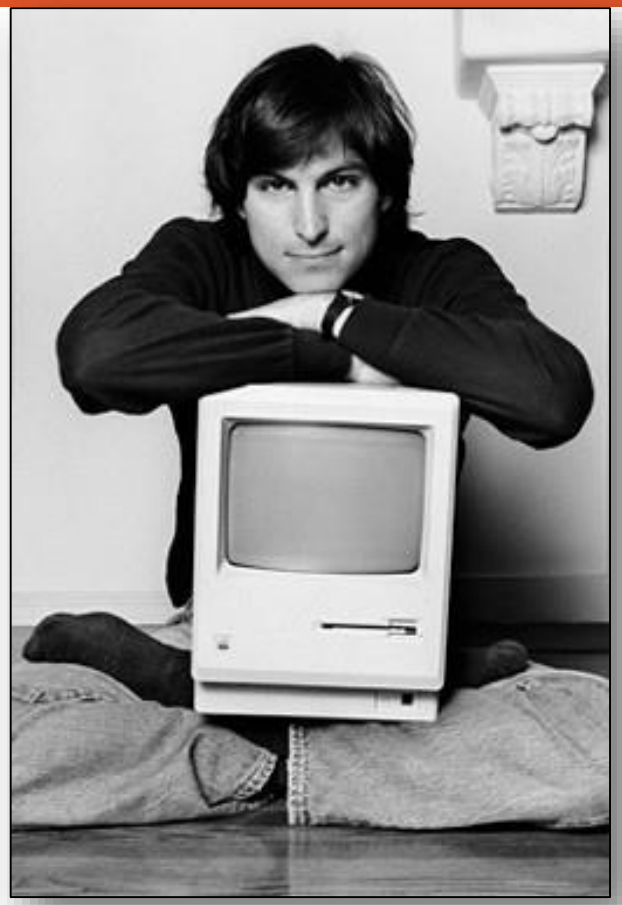
# Bill Gates

- Bill Gates managed to talk IBM into letting Microsoft make the operating system and Gates proceeded to make a fortune from MS-DOS.

- Over the next few years he made billions of dollars and has donated a lot of his fortune to improving the lives of people in developing countries.

# Steve Jobs

- Steve Jobs also dropped out of university at the age of 21 to start his company Apple with another college dropout Steve Wozniak.



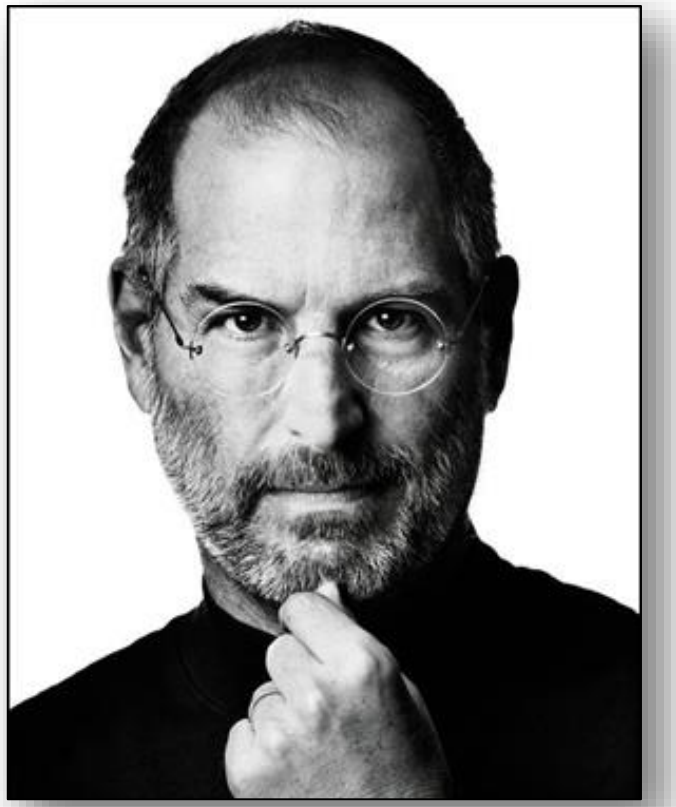
# Apple

- In 1976 this "Apple I" was one of the first home computers and was sold for $600

# Steve Jobs

- The immense success of Apple 2 revolutionised the personal computer market with the invention of the Graphical User Interface (GUI) which made using the computer very user friendly.

- This made Steve Jobs a millionaire at the age of 25.



1955 - 2011

# Steve Jobs

- In 2000 digital music players were big and bulky or small but played terrible quality music.

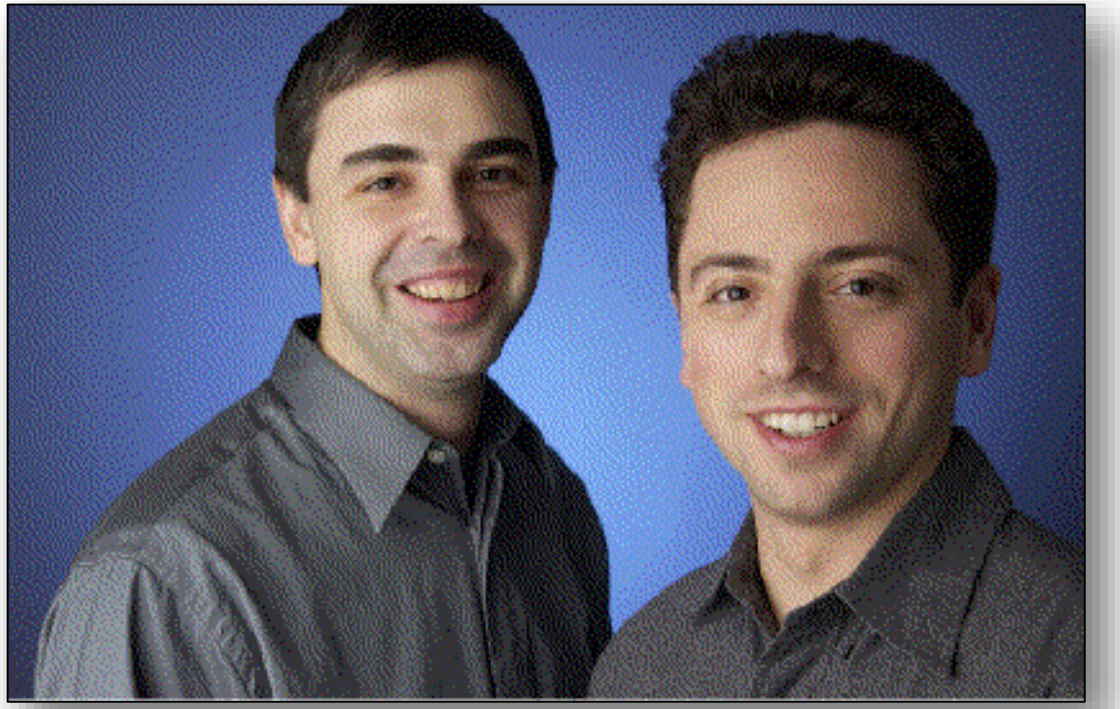
- Apple saw the opportunity and announced the release of the iPod in 2001, the first digital portable music player which changed the course of media entertainment and was followed with equal success by the iPhone and iPad.

# Microsoft v Apple

| Microsoft | Apple |
| --- | --- |
| In 1994 Apple took Microsoft to court to prevent them using the Graphical User Interface (GUI) components that Apple invented | In 1998 Microsoft was valued at $344.6 billion and Apple was only $5.54 billion |
| Apple didn't win the case but Microsoft were told to change the "Trash can" icon on the desktop as it was too similar to Apple's version | By 2011, Apple was valued at $346.7 billion whilst Microsoft was worth $214.3 billion.<br><br>This was the first time that Apple had edged ahead. |
| Microsoft changed it to the Recycle Bin | This change is put down to the success of digital music players and smart phones |

# Larry Page and Sergey Brin

- Larry Page and Sergey Brin met at Stanford University.
- They began to work on developing a search engine called "BackRub"



# Google

- They decide to rename BackRub to Google – a play on the word "googol" a mathematical term for the number 1 followed by 100 zeros.

- This was to show that it was their mission to organise the seemingly infinite amount of information on the internet.

# Google

- From a small company that started in a garage to one of the world's largest companies  with many diverse areas such as its own email system known as
  - Gmail,
  - Google Maps
  - and Google Books.





- On average, Google has been acquiring a company a week since 2010 including
  - YouTube,
  - Motorola Mobility
  - and Android.



- In 2019 Google was estimated to be worth **$927 billion.**

# Key points in modern computing history

| | | | |
|---|---|---|---|
| 1984 | Apple introduces the Macintosh computer | 2001 | Microsoft Windows XP is released |
| 1990 | Microsoft introduces Windows 3.0 | 2005 | Google purchases Android |
| 1992 | Microsoft introduces Windows 3.1 | 2005 | YouTube was founded and appears online |
| 1996 | BackRub was created and launched onto Stamford Universities' servers | 2006 | Google buys YouTube |
| 1997 | BackRub given a new home and changed to the name Google. | 2006 | Nintendo releases the Wii |
| 2000 | Bill Gates relinquishes his title as head of Microsoft and Microsoft Windows 2000 was released | 2007 | Apple introduces the iPhone |
| 2001 | Wikipedia was founded | 2007 | Microsoft releases Microsoft Windows Vista and Office 2007 |
| | | 2010 | Apple introduces the iPad |

# Your answers…

- As you were listening to the presentation you should have been filling in the workbook.
- We will now go through your answers.

# Extension Activity

- Create a poster showing the key points in the development of computers.

- Use the internet to bring in images of the people involved and the main inventions which helped to shape computing today.

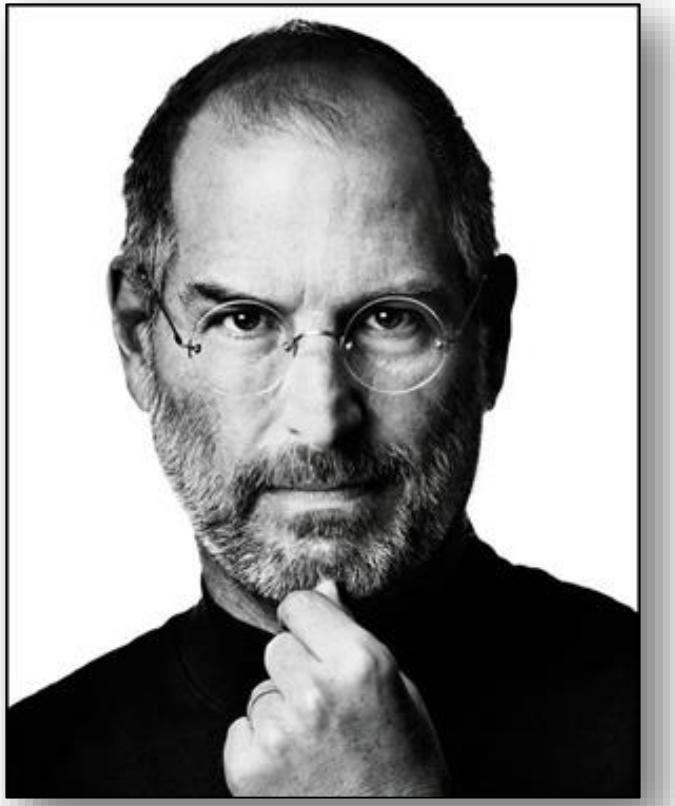
# Plenary

- You are going to play a game of Guess Who.
- I need one volunteer who will sit with their back to the board and will ask questions to the rest of the class to try and guess who is showing on the screen.
- They are only allowed to ask questions with a “Yes” or “No” answer.

- No peeking!

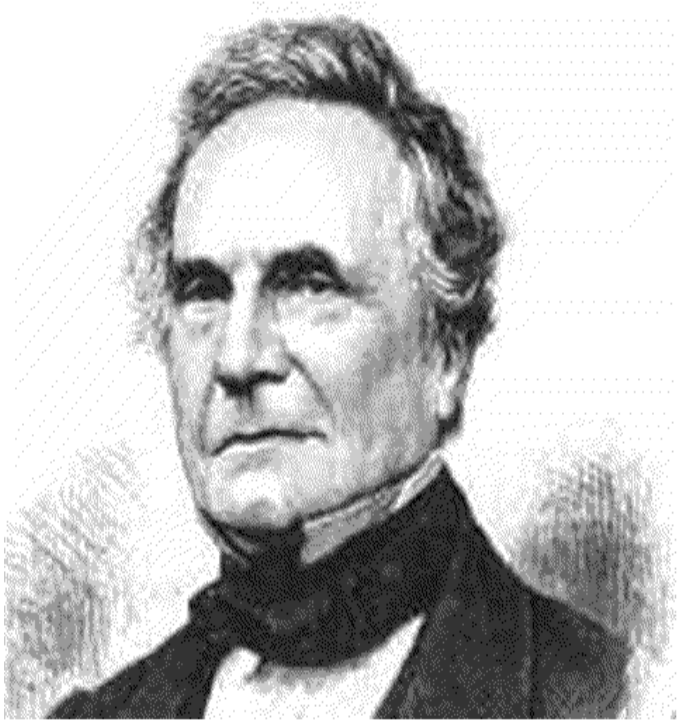
# Guess who this is…

- Name: Steve Jobs
- What was he famous for? Developed the Apple Brand.
- When did this happen? 1970s
- Nationality: American



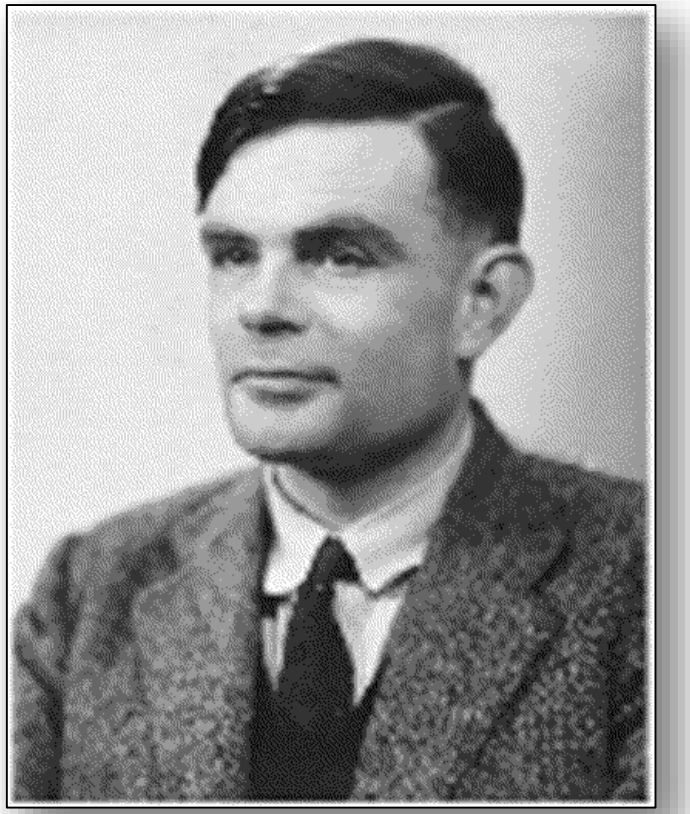
# Guess who this is…

- Name: Charles Babbage
- What was he famous for? He designed the "Difference Engine" and "Analytical Engine"
- When did this happen? In the early 19th Century.
- Nationality: English



# Guess who this is…

- Name: Alan Turing
- What was he famous for? Proved that a machine capable of processing a stream of 1s and 0s would be capable of solving any problem
- When did this happen? 1940s
- Nationality: English



# Guess who this is…

- Name: Dr. Grace Murray Hopper
- What was she famous for? Inventing the "COBOL" language and the term "debugging".
- When did this happen? 1940s
- Nationality: American

# Guess who this is…

- Name: Blaise Pascal
- What was he famous for? Invented the first calculator to help with collecting taxes.
- When did this happen? 1645
- Nationality: French

# 7.3.3 Bletchley Park

THE NATIONAL MUSEUM OF COMPUTING

# Colossus & Bletchley Park - Computerphile

**Lots of People say the ENIAC was the first electronic computer but that's only because no-one knew about Colossus because it was *so* secret!**

- To Watch - https://youtu.be/9HH-asvLAj4

# Impact on Society - Video

(KS3/4 resources)

http://hoc.lgfl.org.uk/resource.html#

1. Why the computers was needed
2. Worlds oldest Original Computer
3. The birth of the Personal Computer

4. https://www.bbc.co.uk/bitesize/clips/zqrmp39

# Look at this t-shirt!

- Look at the Science Museum shop to view online "History of the Personal Computer" timeline t-shirts.. (you are better looking at the second image even though there are some computers missing).

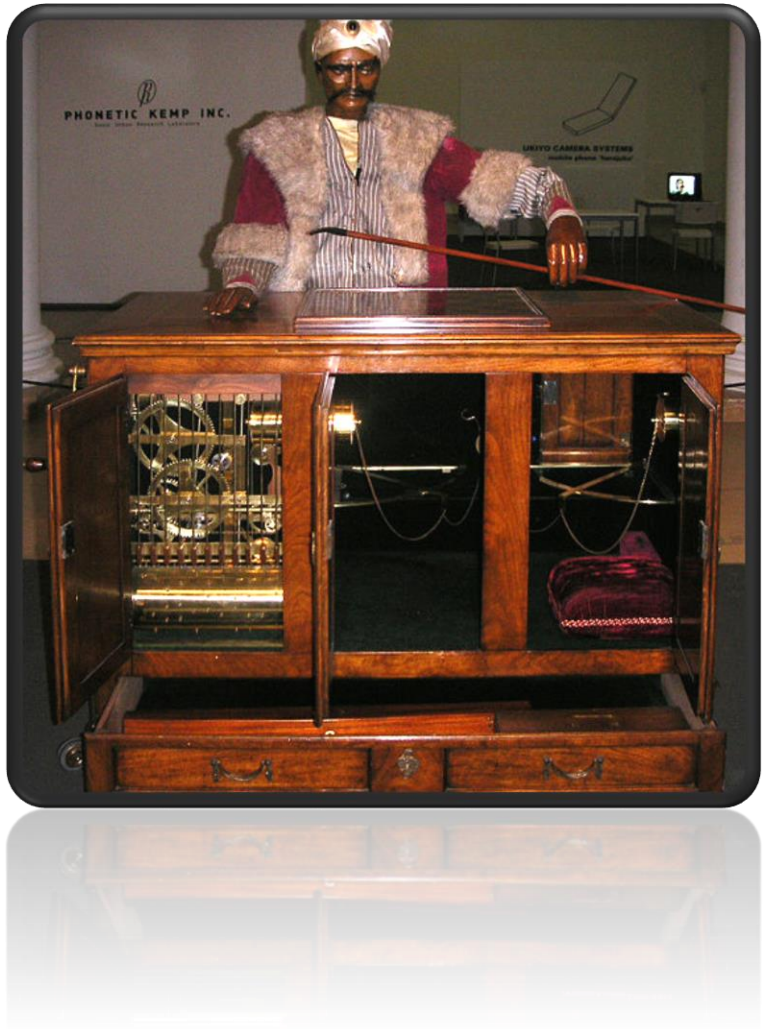

# Create your personal computer timeline

**Activity**

- Use a word processor to create a simple Personal Computer Timeline of 4, 5 or 6 computers from the t-shirt including the following information in table form …

| Name of computer | Year | Picture | Cost today | Memory installed |
|---|---|---|---|---|
| | | | | |

# 7.3.4 Artificial Intelligence



# The Mechanical Turk

- In 1770, at Schönbrunn Palace, the world was introduced to the first Artificially Intelligent machine.
- Called The Mechanical Turk the clockwork machine was able to play chess, and was able to beat all the human opponents pitted against it that day, typically in under half and hour.
- There was one problem with the **The Mechanical Turk**, it was a ***hoax.***
- Inside the mechanism was space for a human to sit, and from where he could operate the machinery.
- It would be over 200 years before a computer was able to convincingly beat a human at chess, when in 1997, Deep Blue beat the World Champion -Gary Kasparov in a 6 game match.

# What is intelligence?


- https://youtu.be/AwMY7cbKU3c

# What is intelligence?

As you will learn, we are already surrounded by AI, whether that be the route finding software in the maps app on your mobile phone, that enemy combatant in your FPS console game or the recommendation software used to suggest products to you based on your previous purchases.

- https://youtu.be/mJeNghZXtMo

# What is AI?


- https://youtu.be/kWmX3pd1f10

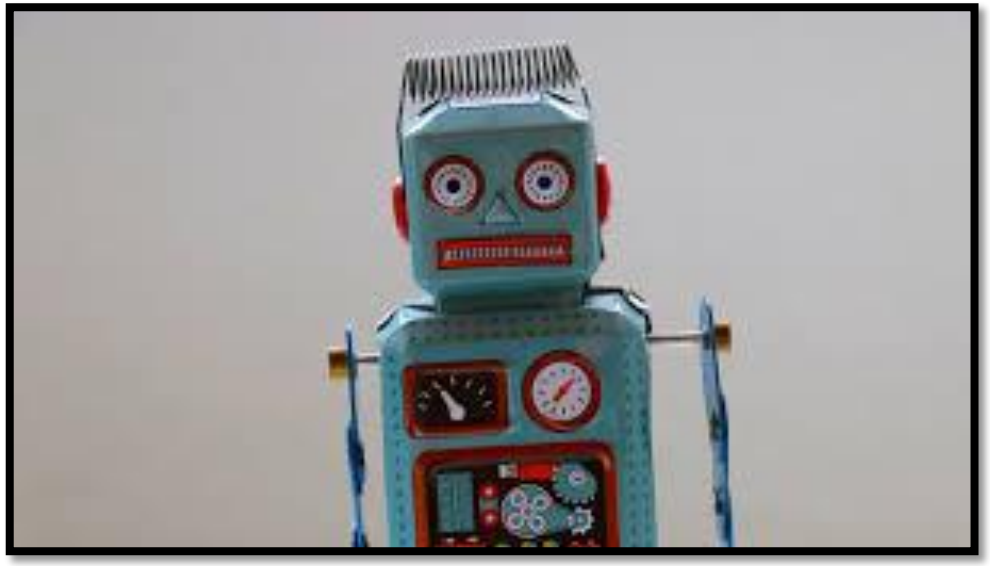
# Basics of AI

There are a ***few basic*** goals of AI research. These are to produce machines or software that are capable of:

- reasoning (making decisions)
- representing knowledge
- forward planning
- learning
- natural language processing (communication)
- perception (sensing an environment)
- move and manipulate objects

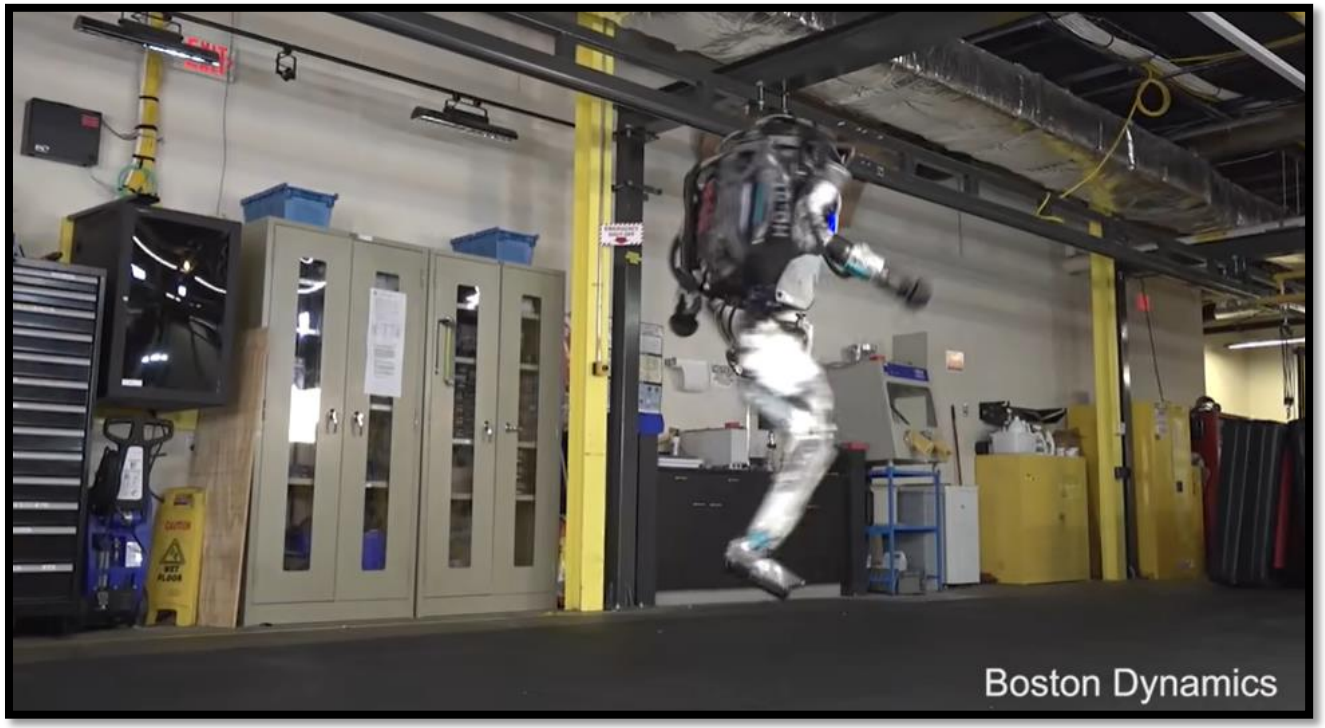
# Activity - AI

- Using your workbook, Watch the following three videos and decide which (if any) of the goals listed above have been achieved by the AIs in the videos by putting ticks in the table.
- For example, put tick in the reasoning column if the AI can perform reasoning in the table.



Video 1

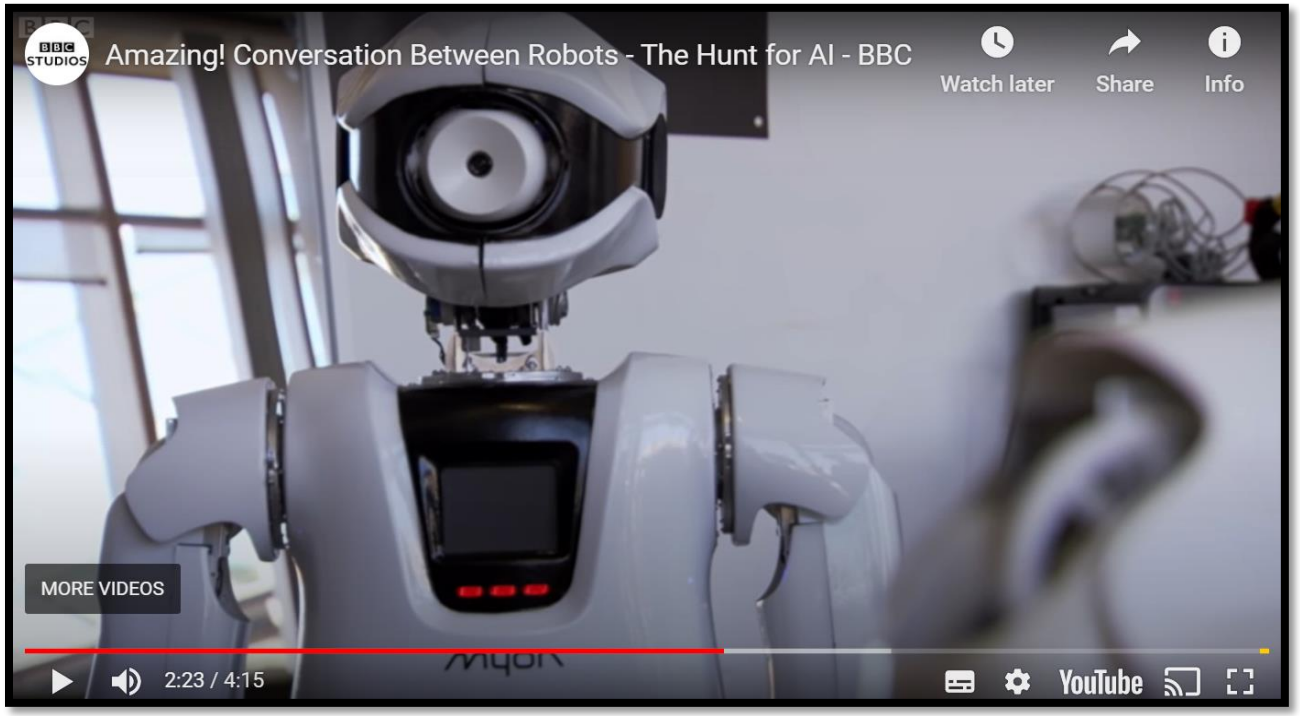
# Boston Dynamics – Atlas Robotics




- https://youtu.be/_sBBaNYex3E

Video 2

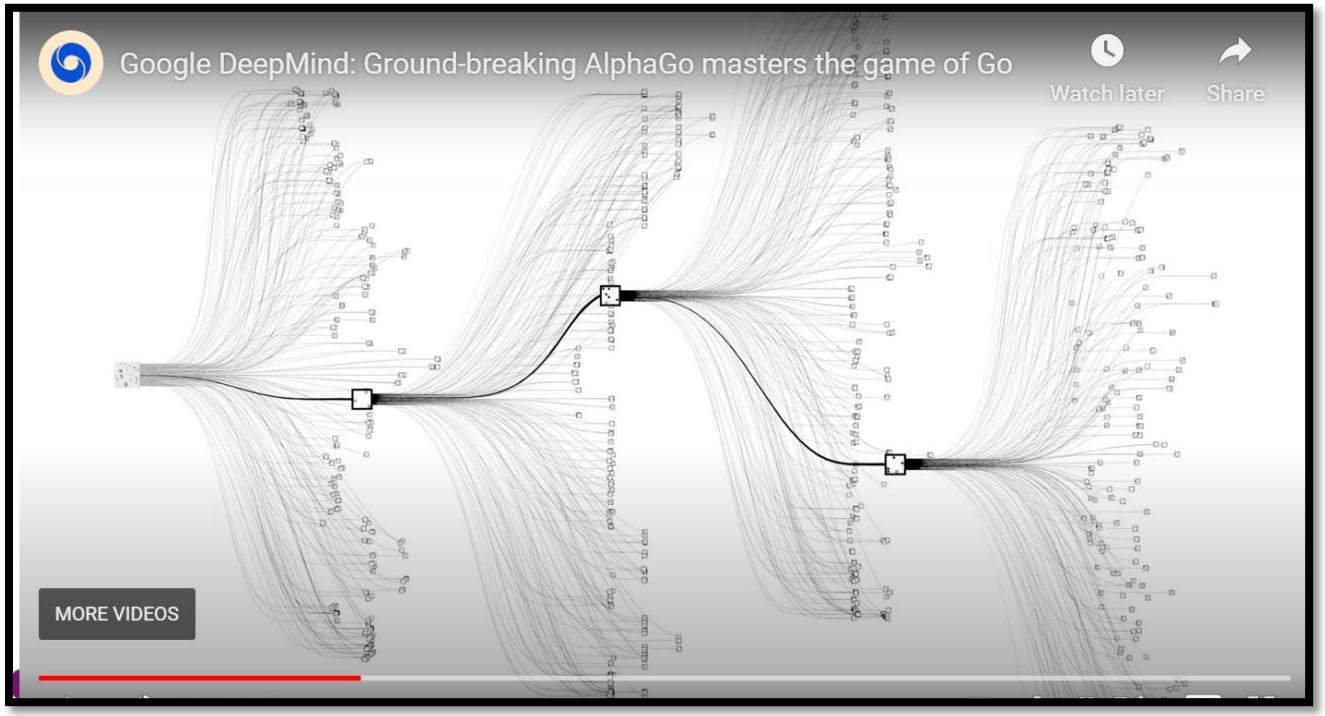
# Conversations between robots




- https://youtu.be/Qh2yT-AL1V8

Video 3

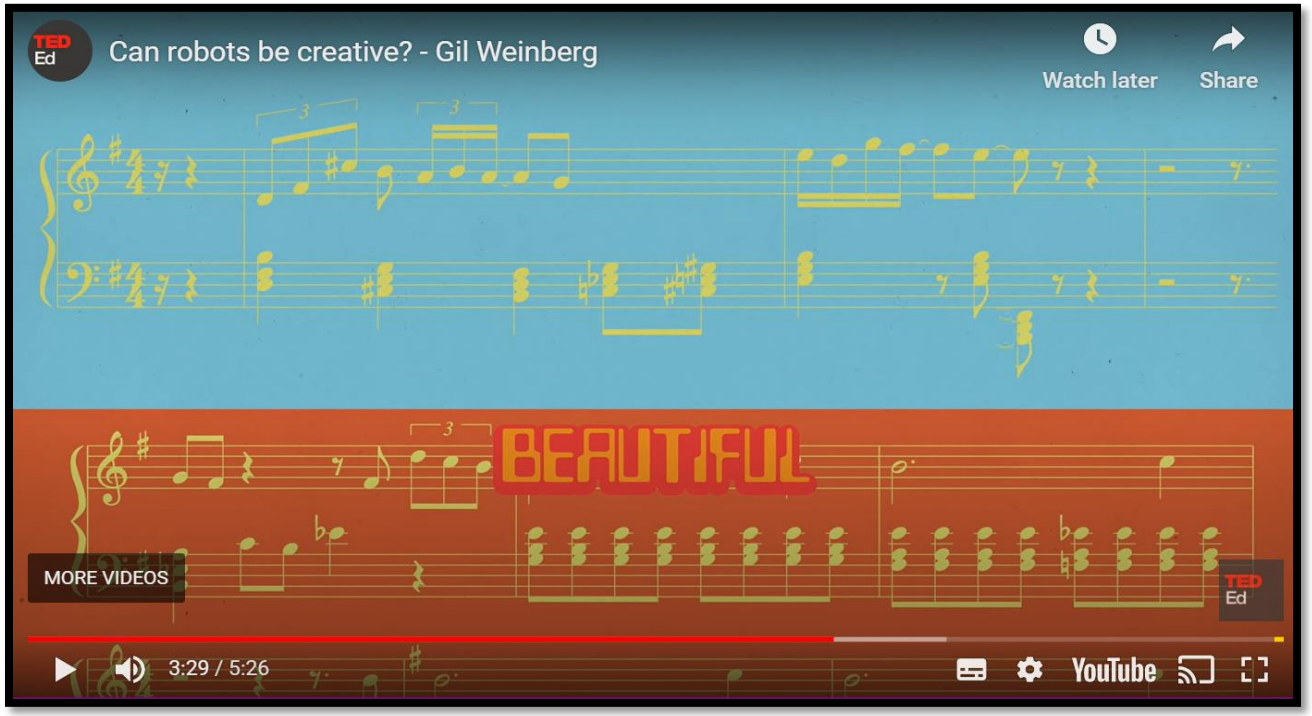
# Google DeepMind




- https://youtu.be/SUbqykXVxoA

Video – deep thinking..

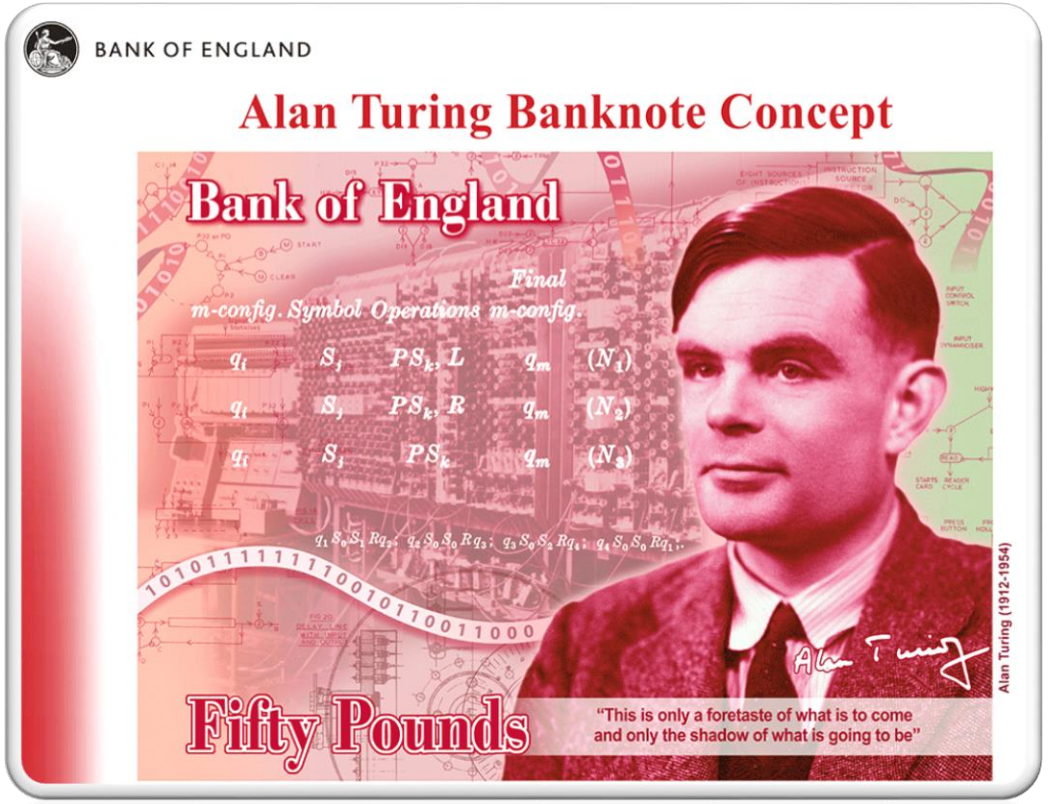
# Can Robotics be Creative?




- https://youtu.be/Rh9vBczqMko

Use this to help you complete the questions in your workbook

# 7.3.5 Alan Turing

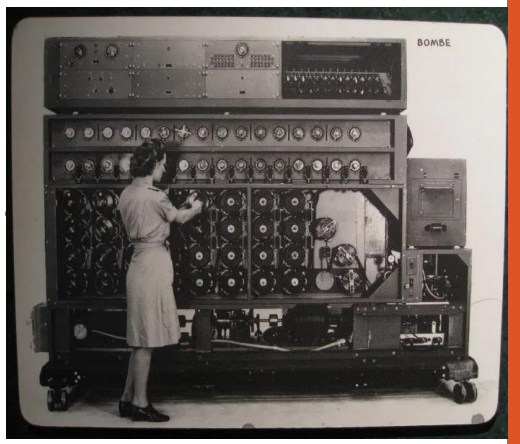


# Turing Machine

- Although people have long thought about the possibility of Machines that could think, the science of AI really started with Alan Turing, back in the **1950s.**

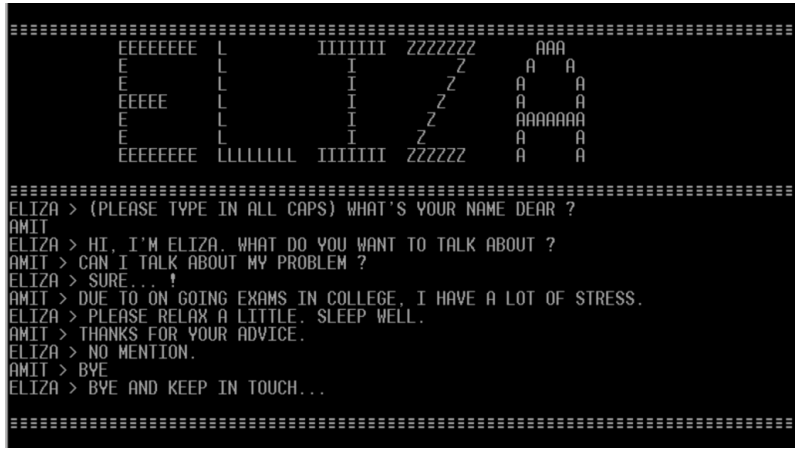
- Turing had devised a hypothetical machine called **The Turing Machine,** that was capable of performing extremely complicated computations.

- Turing devised a party game, called The Imitation Game.
  - In the game, a man (A) and woman (B) would each go off to separate rooms.
  - They could then communicate with the guests at the party, but only through typed messages.
  - The man and woman would try to convince the guests that they were the other.




- The game was invented only to introduce the second more interesting version.
- Turing was arguing, that if a machine can convincingly trick a questioner into thinking it was a human, then it can be classified as intelligent. Or more philosophically- what is the difference between a human and a computer that is indistinguishable from a human?

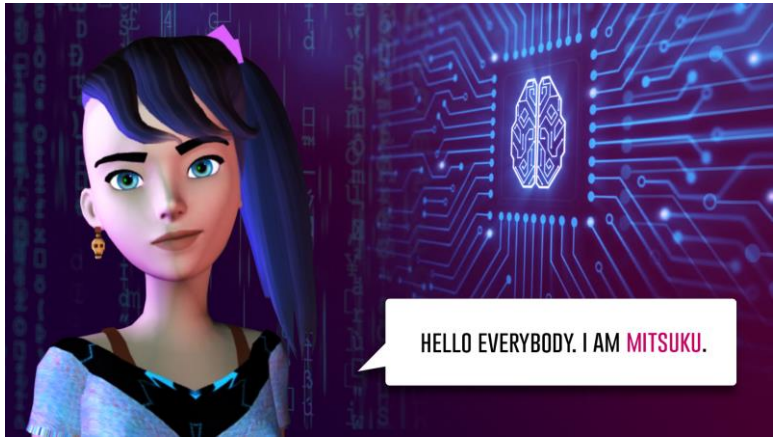
# Lets Chat!




## Task 1

- Open ELIZA and have a chat with her. (https://www.masswerk.at/eliza/)
- She was originally designed as a therapist.
  - In 1966, Joseph Weizenbaum created ELIZA, that appeared to pass the Turing test.
- Weizenbaum's program was able to fool some people into believing that they were talking to a real person, with some subjects being "very hard to convince that ELIZA was not human.

## Task 2




- Another more modern example would be Mitsuku.
- She won many prizes in many international and the Turing competition.

## Task 3

- Write up your opinions on ELIZA and Mitsuku.
  - Do you think either of them passes the Turing Test? Explain your reasons.
  - Can you figure out the rules that dictate ELIZA's responses? Write done the rules you have

# Reverse Turing Test

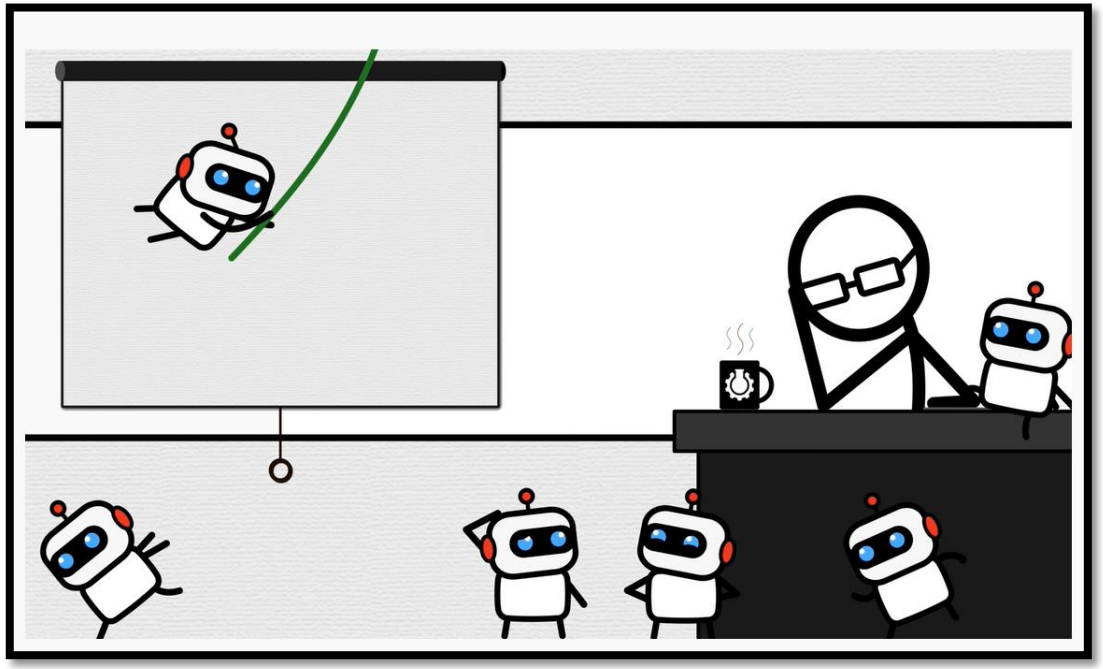
- A CAPTCHA is sometimes describes as a reverse Turing Test, because it is
- Administed by a machine and targeted to a human



- Reversing The Turing Test has become a focus for research over the past few years.
- This means inventing a test that only a human can pass, and computers will always fail.
- The most common form of reverse test, of which you will probably be familiar is CAPTCHA
- The idea behind CAPTCHA is to present to the user an image that a computer would not be able to understand.
- Without CAPTCHA it would be trivial to design a bot that could register a billion different online email addresses that could be used to send spam, for instance.

# Machine Learning

- This idea of improving AIs with training data is called Machine learning.
- Watch video to learn about the concept of machine learning



https://youtu.be/R9OHn5ZF4Uo

# Machine Learning

- There is now an interesting battle between bots and CAPTCHA programs.
- In fact, Google have been using CAPTCHA to **train** their AIs.