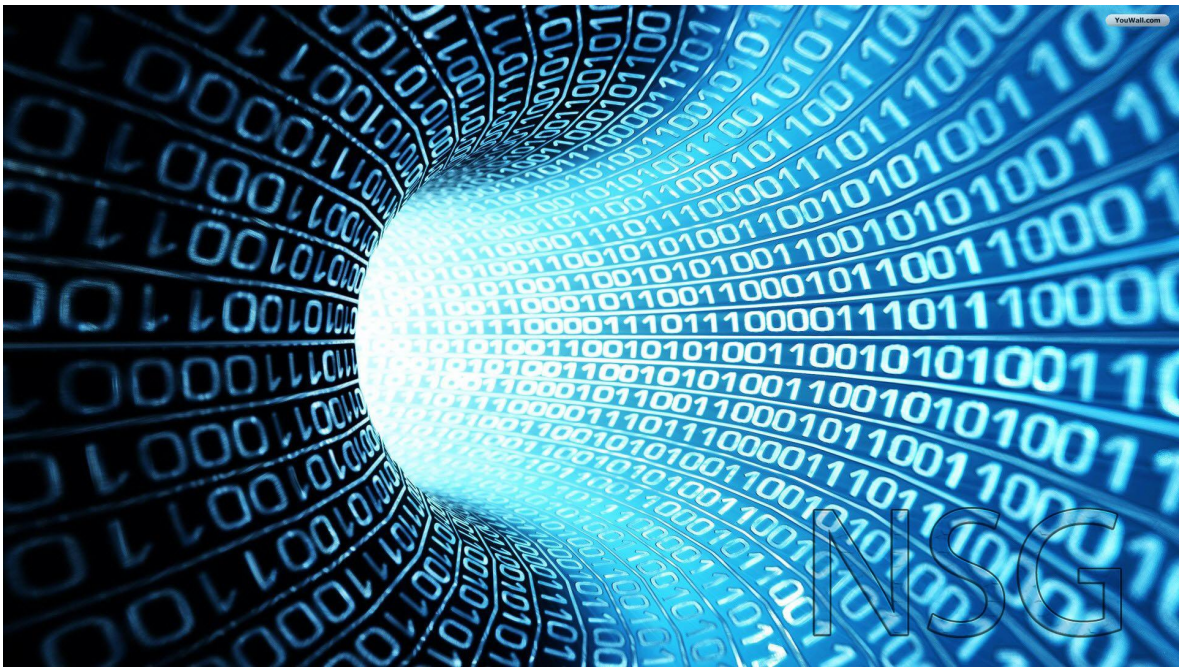
Transition Pack for A-level Computer Science

Get ready for A-Level!

A guide to help you get ready for A-level Computer Science, including everything from ideas for days out to online learning courses.



So you are considering studying A-level Computer Science?

This pack contains a programme of activities and resources to prepare you to start A level Computer Science in September. It is aimed to be used after you complete your GCSE throughout the remainder of the Summer term and over the Summer Holidays to ensure you are ready to start your course in September. If you would like an electronic version of this guide, please email me at bwainwright@nsg.northants.sch.uk

Lots of resources in this pack are web based, so QR Codes have been provided for you to quickly access them on your phone or tablet.

You will need to download a QR reader for your device. Free readers are available from the Android playstore and Apple App store.

Why Computer Science?

Below are some presentations to provide inspiration and explain why it is a great time to be studying Computer Science.

10 Life-Changing Reasons You Should Learn To Code

Available at:
https://skillcrush.com/blog/laurence-bradford-10-reasons/
Laurence Bradford describes how learning to code opened up many more options for her.

Anybody Can Learn Code:
Available at:
https://www.youtube.com/watch?v=nKIu9yen5nc
will.i.am and friends talk about why to get into coding and also give a small insight into the working environment.

The poetry of programming
Available at:
https://www.youtube.com/watch?v=-jRREn6ifEQ
Linda Liukas wants to create a more diverse and colourful world of technology, starting with the poetry of code.

Learning to Code:
Available at:
https://www.youtube.com/watch?v=XKL4lBlmeXE

Susan Kish talks about why knowledge of coding is so important for business leaders.

The coders behind social media apps: Ruchi Sanghvi

Ruchi Sanghvi became the first female engineer at Facebook, one of the first 10 engineers hired by the company

She built the social network's most defining features:

News Feed: friends' online activities front and center on Facebook

Platform: for third-party developers to build apps on Facebook (games!)

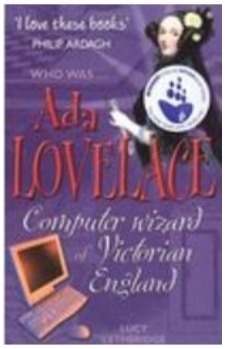
Example

Connect: login using Facebook on many websites on the web.

Use the QR code above to hear Ruchi's story in her own words

Book Recommendations

Kick back this summer with a good read. The books below are all popular computing books and great for extending your understanding of Computer Science.



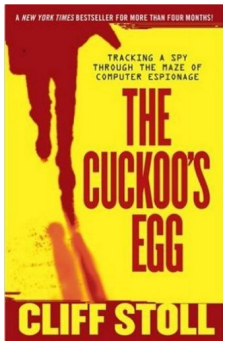
Ada Lovelace: The Computer Wizard of Victorian England (Who Was...?)
by Lucy Lethbridge

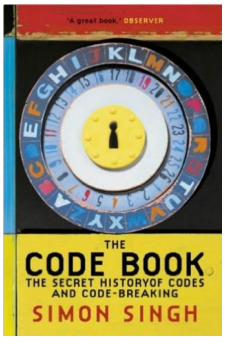
Daughter of the poet Lord Byron, Ada Lovelace was a child prodigy. Brilliant at maths, she read numbers like most people read words. In 1834 she came to the attention of scientist Charles Babbage, who had just built an amazing 'thinking machine'. Thus began a remarkable collaboration in the invention of computer.

The Cuckoo's Egg: Tracking a Spy Through the Maze of Computer Espionage

by Cliff Stoll

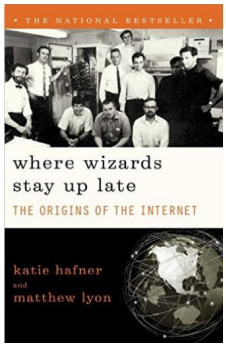
A true tale of electronic skulduggery and detection in the world of computers. It tells of a year the author spent tracking down a hacker who was using his computer as a way station to gain access to dozens of other systems all over the US, including sensitive military and intelligence networks.





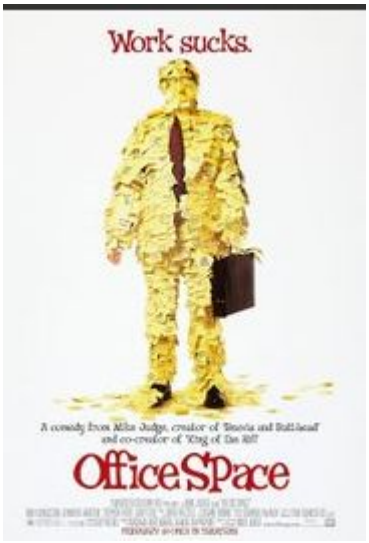
The Code Book: The Secret History of Codes and Code-breaking
by Simon Singh
The Code Book contains many fascinating accounts of code-breaking in action, from its use in unmasking the Man in the Iron Mask and the defeat of the Nazis to the breaking of a modern cipher system by a world-wide army of amateurs in 1994. It is especially good on the most recent developments, such as quantum cryptology and the thorny civil liberties issues raised by the advent of very secure cipher systems over the Internet.

Where Wizards Stay Up Late: The Origins of the Internet
by Katie Hafner
Twenty five years ago, it didn't exist. Today, twenty million people worldwide are surfing the Net. "Where Wizards Stay Up Late" is the exciting story of the pioneers responsible for creating the most talked about, most influential, and most far-reaching communications breakthrough since the invention of the telephone.



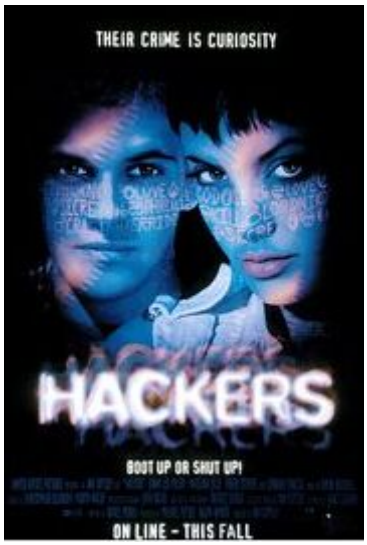
Movie Recommendations

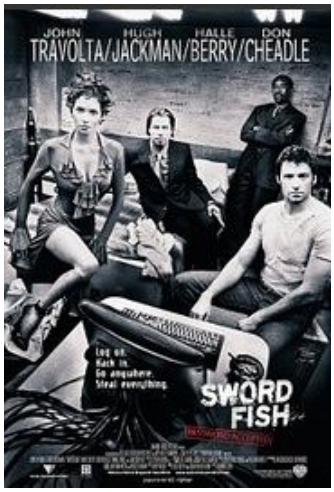
Everyone loves a good story and everyone loves some great computer science. Here are some of the picks of the best films that will provide food for thought of the impact of computer science on our society. Great watching for a rainy day.



Office Space: A comedy where a disgruntled employee uses a virus to exact revenge on his employees.

Hackers: Young computer hackers are caught in a cat & mouse game against an evil villain.





Swordfish: A specialist counter-terrorist team employ a hacker to gain funds for their operations.

Tron: Have you ever felt trapped by your computer? In this movie, a hacker actually is, and has to overcome a program that holds him captive.

Wargames: Oops! An unsuspecting computer prodigy accidentally starts World War III when he hacks into a military computer to play a war game.

Ideas for Day Trips

If you are on holiday in the UK, or on a staycation at home, why not plan a day trip to one of these attractions. Use the QR Codes to access the website for each attraction. Please check opening hours before travelling.

Museum of Science and Industry, Manchester

National Media Museum, Bradford, New Media Collection

The Centre for Computing History, Cambridge

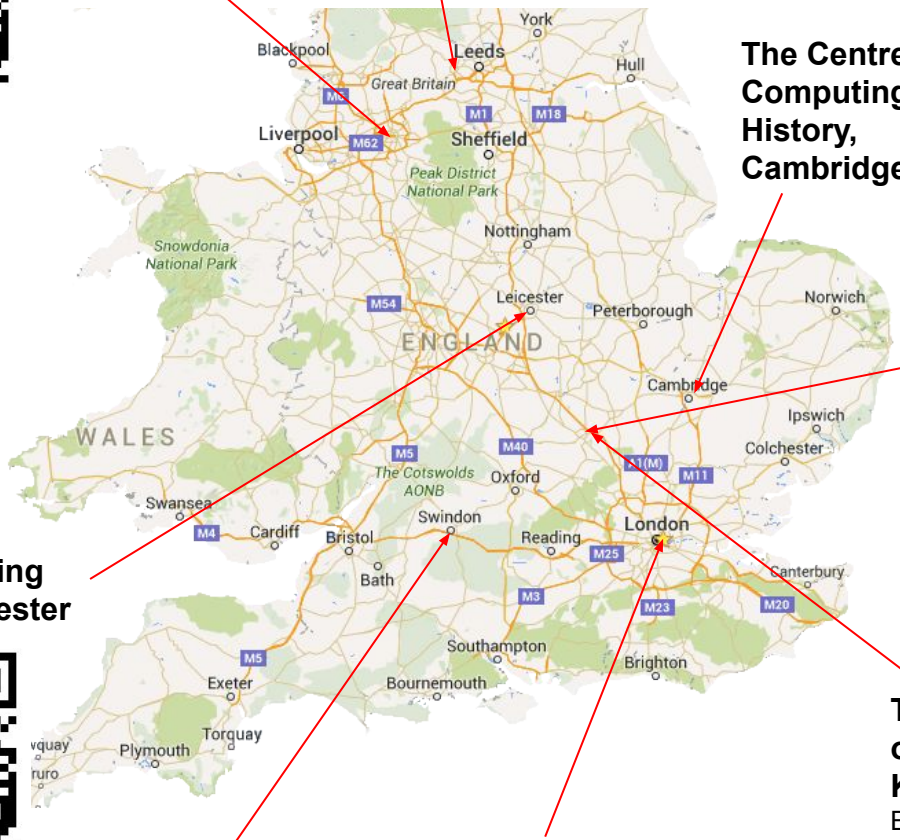
Bletchley Park, Milton Keynes

Retro Computing Museum, Leicester

The National Museum of Computing, Milton Keynes Housed at Bletchley Park

Information Age gallery Science Museum, London

Museum of Computing, Swindon



Developing your coding skills

It is important to build your confidence with coding. There are many online courses you can follow to develop these skills. A selection of the best are given below. All languages use a fairly limited set of program constructs, so the chosen language is not too important. However, I would like you to do a course in Python first, possibly followed by a second language if you have time.

Python School
www.pythonschool.net/
This site was initially put together for teachers to use but it is also a great course for students to follow. ***Do at least , Basics and Data Structures & Algorithms.***

Code academy
www.codecademy.com/
This site has courses for a wide range of languages.

W3Schools
www.w3schools.com/
This site mainly focusses on html and Javascript.

Codeclub
www.codeclubprojects.org/en-GB/
A site designed as a basic introduction to coding. A useful site to build the basics if the above prove initially too challenging.
ClubID: GB5680D
Pin: 7895

Tools You Need for Programming

Below are links that will enable you to download the tools you will need for the coding development. I recommend you download these before the end of summer term so that you can contact me at school if you have any technical issues. My email is bwainwright@nsg.northants.sch.uk

Notepad ++
https://notepad-plus-plus.org/
This is a great editor that can be used to write code in many different languages. Very useful if you are writing html and/or Javascript.

Python 3.6
https://www.python.org/downloads/
This will provide you with both an editor (IDE) and will run the Python code you create. You can get versions for Windows and Mac OSX.

Configuring your Python IDLE
When you first open your Python, it may be the Shell window where you can only write one line of code at a time. To have Python always open up in the editor window, follow the instructions in the link below.
https://docs.google.com/document/d/1iWg7JtHqED9nXVmgkbspmA9hvh5ltAru7GygjgySG1c/edit?usp=sharing

Thonny
This is an alternative IDLE to the standard Python one. It has some additional features but is still simple enough to learn quickly. You can download for free from the linked website.

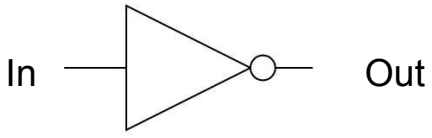
https://thonny.org

Task 1: Truth Tables Task Sheet

Revision of GCSE knowledge:

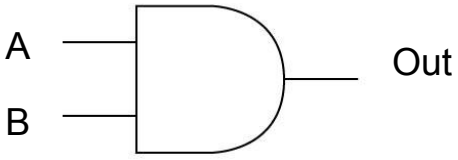
Below are the logic gates we studied at GCSE level. For each one, complete the truth table.

NOT Gate



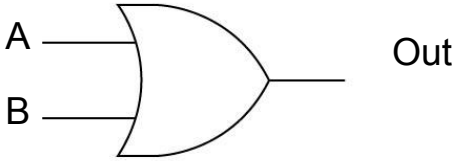
In	Out
0	
1	

AND Gate



A	B	Out
0	0	
0	1	
1	0	
1	1	

OR Gate



A	B	Out
0	0	
0	1	
1	0	
1	1	

Task 1: Truth Tables Task Sheet

1) For each of the expressions below, write out the truth tables. Don't forget, just like in maths, we do the brackets first.

NOT (A AND B)

((NOT A) OR (NOT B))

2) What do you notice about these tables?

Task 1: Truth Tables Task Sheet

3. Design and create a program to output the value of 'a' after the statement.
IF (a < b) OR (b < c) THEN a = b
has been executed. Use any language you want to write the program.

Designs:

Code:

Task 1: Truth Tables Task Sheet

4. Decide on suitable test data for this program giving a reason for each combination of values for a, b and c, give your expected result and the actual result for each.

Values	Reason	Expected	Actual

Task 2: Converting between Denary, Binary and Hex.

Complete the table below.

No.	Denary	Binary	Hex	Binary value plus 00011110
1	1			
2	5			
3	10			
4	22			
5	40			
6	77			
7	91			
8	121			
9	144			
10	168			
11	170			
12	200			
13	211			

Task 3: Coding Challenge

Complete the table below.

Activity 1a: Average of an array

Create a procedural program that can be described in structured English as follows:
The ‘Average of an Array’ program

Step 1: User repeatedly enters numbers into an array
Step 2: Array average is calculated by finding the sum of the array and the number of elements in it.
Step 3: The result of the calculation is output
Step 4: User is asked if they want to repeat the program

Activity 1b: Redo your program from 1a using functions (subs that return values) for all procedures except main()

Activity 1c: How would you carry out unit tests on your procedures?

Evidence

Task 3: Coding Challenge

Evidence

Task 4: Emerging computer technology

In this task you get to investigate any area of emerging computer technology which interests you.
You can pick any area which interests you, but examples could be:

- Artificial intelligence
- Robotics
- Automated self driving cards
- Quantum computing

In no more than ONE side of A4 summarise the area you have chosen under the following four headings:

1. What is it?

2. What are the possible Social, Moral, Cultural and Ethical **benefits** of this technology on society

3. What are the possible Social, Moral, Cultural and Ethical **risks** of this technology on society

4. My conclusion on this technology and what it will mean for our world 10 years from now

Useful information:
https://student.craigndave.org/videos/slr-17-ethical-moral-and-cultural-issues

Task 4: Emerging computer technology

Task 5: Augmented reality

A key skill at A Level is being able to take a topic and then discuss it in the context of different scenarios.

Most theory-based exam questions will be asked in the form of a scenario, simply regurgitating what you know on the topic without contextualising your answer to the scenario will often result in low marks!

The topic for this exercise is “Augmented Reality”. It is a truly fascinating area of technology which has the potential to change almost every aspect of our daily lives.

Watch this brief video to learn more:
https://www.youtube.com/watch?v=vQtwWzfzKXI

After watching the video complete the next slide which asks you to discuss the benefits, limitations and risks of augmented reality in the context of:

- Medicine & health care
- Gaming & entertainment
- Schools & learning
- Travel & tourism
- Social media
- Transport & navigation

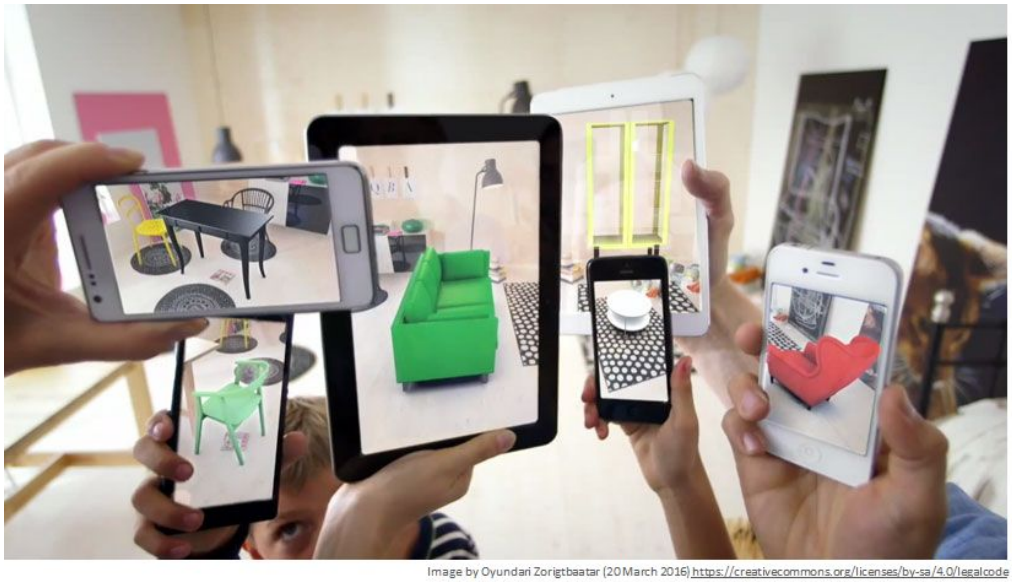


Image by Oyundari Zorigtbaatar (20 March 2016) https://creativecommons.org/licenses/by-sa/4.0/legalcode

Task 5: Augmented reality

For each area: Discuss the **benefits**, **limitations** and **risks** of augmented reality in this context:

Medicine & health care
Gaming & entertainment
Schools & learning
Travel & tourism
Social media
Transport & navigation