# **Computer Science Transition workbook**

- The topic of **Computer Science** is at the heart of the modern world
- Studying it can make you extremely sought after in todays job market
- The transition from GCSE to A level is significant, this includes:
  - An increased emphasis on technical content
  - An increased emphasis independent research

This workbook is designed to allow you to practice some of these skills and build on your existing knowledge.

Please complete by your first lesson back in September.



The course is assessed by 2 exams (50% each exam)





#### Why did you choose Computer Science?

#### Expected time to complete: <sup>1</sup>/<sub>2</sub> hour

In this simple task you get the opportunity to tell me your choices and reasons behind choosing to study Computer Science. Please answer all questions as best you can.

1. Why did you choose to study A level Computer Science?

2. What other courses have you chosen to study at Key Stage 5, and what made you choose this combination?

3. What are you hoping to achieve from studying Computer Science?

4. How would you describe yourself as a learner at GCSE? What skills where you good at, what areas would you like to improve on?

5. What are your other hobbies and interests outside of school? Anything related to Computing?

## ) Independent research task



### **Emerging computer technology**

Expected time to complete: 2 hours

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

#### Additional help:

For additional help and support in structuring your answer you might like to watch some of the videos from the following Craig 'n' Dave playlists:

OCR: SLR 17 – Ethical, morale and cultural issues https://student.craigndave.org/videos/slr-17-ethical-moral-and-cultural-issues

AQA: SLR 19: Moral, social, legal, cultural issues <u>https://student.craigndave.org/videos/slr19-moral-social-legal-cultural-issues</u>



## Thinking like a computer

Expected time to complete: 2 hours

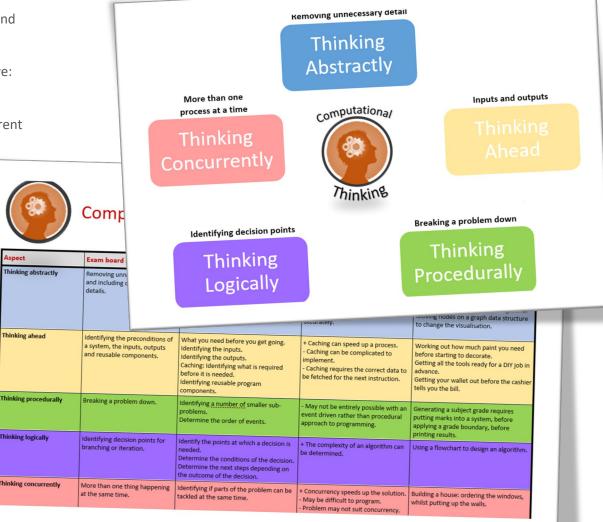
At the heart of Computer Science is the ability to look at problems, analyse them, break them down and solve them in a way which involves a variety of "Computational Thinking" skills.

- 1. Download the "Computational thinking and Computational methods placemats" from Craig n Dave:
  - <u>https://student.craigndave.org/specification-key-terminology-and-cheat-sheets</u>
- 2. Create your own spider diagram / mind map which shows your clear understanding of the 5 different computational thinking strands
  - Keep it to a single side of A4 / A3
- 3. Your goal is to imagine someone else has to revise from your mind map. Ask yourself:
  - Does it make sense?
  - Is it clear?
  - Does it cover all of the important concepts?

#### Note:

Although the five strands listed (and the download resources provided for this task) are from the OCR AS / A'Level specification, the concepts of "Computational Thinking" are just as applicable to the AQA course.

Indeed many of the strands listed are explicitly covered in the AQA specification in different locations.



## ) Note taking practice task



## The Cornell method of note taking

The expectation to do independent research at A Level will increase dramatically from GCSE.

There is a real skill to taking decent notes outside of lesson which are of value. Research has proven that one of the most effective methods is the "Cornell" note taking method.

- 1. To start download the "Cornell note taking template" from Craig n Dave:
  - <u>https://craigndave.org/product/cornell-note-taking-template/</u> or from <u>https://www.monash.edu/\_\_data/assets/word\_doc/0009/408465/cornell-note-taking.doc</u>
- 2. Pick any two of the following videos from Craig 'n' Dave:
  - AQA: https://student.craigndave.org/videos/aqa-alevel-slr06-procedural-functional-data-abstraction
  - AQA: https://student.craigndave.org/videos/aqa-alevel-slr13-sample-resolution-and-rate
  - AQA: https://student.craigndave.org/videos/aqa-alevel-slr13-encryption-vernam-cipher
  - AQA: https://student.craigndave.org/videos/aqa-alevel-slr20-bit-rate-baud-rate-bandwidth-and-latency
  - OCR: <u>https://student.craigndave.org/videos/ocr-alevel-slr01-alu-cu-registers-and-buses</u>
  - OCR: <a href="https://student.craigndave.org/videos/ocr-alevel-slr04-paging-segmentation-and-virtual-memory">https://student.craigndave.org/videos/ocr-alevel-slr04-paging-segmentation-and-virtual-memory</a>
  - OCR: <u>https://student.craigndave.org/videos/ocr-alevel-slr05-stages-of-compilation</u>
  - OCR: https://student.craigndave.org/videos/ocr-alevel-slr14-data-structures-part-2-graphs
- 3. Write the title of the video and its topic in the top boxes (use a different sheet for each video).
- 4. In the main "Notes" section, write notes from the video. You can do this in any way you like, a suggestion might be to rewind slightly when the canvas changes, thinking carefully about what was important in the previous few minutes.
- 5. Having recorded the notes, review them:
  - Turn each part into a question in the section on the left.
  - For example, the notes may say, "The value of the program counter is passed to the memory address register".
  - The question then becomes, "which register is the value of the program counter passed to?"
  - Sometimes these questions are easy, and at times they are more difficult to write.
  - There may also be more than one valid question.
  - You will need to decide for yourself which are the most appropriate questions for revision.

Expected time	e to	complete:	11⁄2	hours
---------------	------	-----------	------	-------

Video Title:		Topic/SLR:	
Questions	Notes		
Keywords & Defir	itions		
Keynolde			

) Key terms task



## Getting to grips with terminology

An important aspect of being successful with your study of Computer Science is getting to grips with subject related terminology. There are over 240 specific terms you will need to learn!

Below are a handful of the key terms you will need to become familiar with.

Control Unit	Register	Busses
Von Neuman Architecture	Optical Storage	Operating System
Intermediate Code	Device Driver	Compiler
Assembly Language	Machine Code	Lossy Compression
Hashing	Normalisation	TCP/IP Stack
Packet Switching	ASCII	Problem Decomposition

1. Research each of the key terms and write a definition.

- 2. Resist the urge to simply cut and paste a definition from the first website you find. Many definitions found on The Internet are overly complicated and wordy.
- 3. Ask yourself:
  - Does my definition make sense?
  - Is it succinct, to the point?
  - Does the definition have appropriate depth and detail for A'Level?
  - Could I give this definition to another student so they could revise from it?

	Structure and function of the processor	Structure and function of the processor	Structure and function of the processor	Structure and function of the pr
Address Bus	Control Bus	Fetch-Decode-Execute	CPU	
"The part of the bay which carries identification about where the data is being user."	"This bus carries command and costed signals to and from every other component of a		Circle	Clock Speed
	computer."	"The complete process of retrieving an instruction from stees, decoding it and complex cost. Also known as the instruction cycle."	"The main part of the computer, consisting of the registers, AUI and control and,"	"Remarks in State, the dash stated is the features of which the based of
				"Measured in Berls, the dash speed is the frequency at which the internal siz patient. The higher the dash role, the faster the computer may wark. The 's electronic unit that unchronium indeed components by generating patient at a
Presidenti comparise provides	WHILTE: COMPLETE DECEME	ANAUTIC COMPUTER INFORM		
1 *	12 *	12	eletito coeruto potosi ·	HANAJADI COMPUTER DOTTING
		13 *	14 *	15
Structure and function of the processor	<b>A</b>			
Processor	Structure and function of the processor	Structure and function of the processor	Structure and function of the processor	Structure and function of the pro
Cores	Cache			Structure and function of the pro
		Pipelining	Von Neumann Architecture	Harvard Architecture
Agent of a multi-core processor. A multi-core processor is a single-component with two or one independent actual OP(n, which are the orth-mappendia); for the faith-decade-core care cale."	"Agent of the main store between the central processor and the next of the memory. It has extremely had access, so succions of a program and its associated data are copied these to take advantage of its shart tests cycle."	"Secondar dags of an instruction sequence are executed in turn by a sequence of speed data	-	
-	advantage of the shart both cycle."	"Terrenties dags of an instruction sequences are near-statulin turn by a sequence of some statu to operate concurrently, so that another instruction can be begun before the previous one is finished."	"Swittings" computer architecture that haves the basis of next digital computer spatenes. A single control with managers program control these follower sequence of "Self- densite execute".	"A computer architecture with physically separate energy and signal pethosys for and data. These early machines had data datage settindy contained within it processing with, and provided to access to the instruction storage as do
No. 10 Contractor Annual				producing serve, and provided no across to the instruction storage as do
6 *	A A A A A A A A A A A A A A A A A A A	MALUS COMPUTES DECIMA	MAA/VE COMPLETE SECTIONS	WALTE CONFUSE PETER
*	17 *	18 *	19 *	20
				20
Structure and function of the processor	Types of processor	Types of processor	-	
		Types of processor	Types of processor	Types of processor
Contemporary Architecture	CISC	RISC	en (†	
"Rep maders set of daughters that describes the functionality, the organisation and the	"Complex instruction Set Computer"	"Refund Instruction Set Computer"	GPU	Multicore System
inglemantation of computer spikers."	"A design that produces a complicated and expension integrated diruct capable of performing alongs scripty of complex integrations. Complex interactions can be menuted with few minimum capits."	"A design that produces a simple, chaop bitograded should will a basic range of machine instructions. Askes on speed as camples instructions bits mere machine cycles."		"Development of CNC architecture with several web of CPU components in
			"A questified decreasis canad designed to spiely needpoints and also memory to accelerate the creation of inspine is in terms buffle sitescient for output to a fausine. Montes Gifachapty panellal doctors makine beam terms decrease designeers deproses CAA for algorithms where processing of large blocks of data is done in parabot."	the second secon
MARAUTS COMPLETER SECTIONS	mail to compute income			
1 *	22 *	23 ·····	MAN, Nr. Charlottic beimag	MAA/UL COMPUTER DOCUME
	*	23 *	24 *	25
Types of processor	~			
a types of processor	Input, output and storage	Input, output and storage	input, output and storage	Input, output and storage
Parallel Processor System	Input Device			Input, output and storage
	mbar peace	Output Device	Storage Device	Magnetic Storage
The simultaneous use of second presencers to perform a single job. 6 job may be upfit into a number of tasks such of which may be presented by any mellable presence."	"Boy peripheral device that can accept date, presented in the appropriate reachese-matching form, decode it and transmit it as electrical pulses to the CPU"	"May peripheral device that transisten signals from the computer into a burnar-resolutio form, or into a faute sublidie for represensing by the computer at a later sings."		ind Bricke Storage
	the construction of the second s	or into a torm sublidie for representing by the computer of a later stops."	"May modure (splical, magnetic, weld state and even japper which holds date or programs"	"Range medium which uses surfaces costed with a layer of magnetic material on a can be shared by magnetically setting the amaganeses of the magnetic material. Its by electromagnetic read/write bands."
				by electromagnetic read/write heads.*
6	AND AND COMPARED PRIMAR	MARANE COMPLEX EXCEMENT A	MARA/EL COMPLETA FORMAL	-
• *	27 *	28 *	29 *	30
			*	30
Input, output and storage	input, output and storage	input, output and storage		
		Input, output and storage	Input, output and storage	Input, output and storage
Flash Storage	Optical Storage	RAM		
Collection of memory chips that is controlled by its own software to make the collection of		"Status loss Menor"	ROM Theat Only Mensary	Virtual Storage
Calibritian of nummery chips that is controlled by its court sufficient to make the collection of chips act like a disk drive."	"Remajor medium that own plants data at which the data is stand as patterns an the surface in pits and lass."	"Website main neurons, Access from an weighter, Often indexed to in Main Managa, ethicuph KMI can be used in main areas of impacting and comparing durings. When used an main means, MAM quickly use the throught of in controls of the Versiting Marine, and the is use and the data three programs are using while the comparing a second		"Bets stared on remain hard data account over the interval."
		must memory BAM typically can be thought of an carbaining the Operating Sprine, programs in one and the data three programs are using while the computer is sussing."	"Mamory for which the operants may be need by cannot be written to by the computer option. Software in BOM in family manufacturing. It spically being independent option have up indiructions. BOM is non-validation. Bead on the spice of EVA and a written to in limited ways, these include, FEORI, CPROM and CARDIN."	. And there is result had dids account over the internet."
ANALAS CONVERSION	WHILTS CONTURA DOCTAN			
1 *	32		ANALYSI COMPANY POTTALS	MALUEL COMPUTER SPOTIAL
	*	33 +	34	35

#### Expected time to complete: 2 hours



#### Expected time to complete: 6 hours

Programming basics

Learning to "code" is a fun and essential part of A Level Computer Science. This task is ideal if you haven't done the GCSE in Computer Science or you simply want a nice refresher ahead of starting your A Level course.

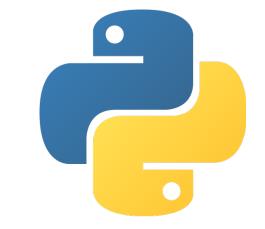
- 1. Head over to the web site: <u>https://www.learnpython.org/</u>
- 2. Complete the following python tutorials under the heading:
  - Hello, World!
  - Variables and Types
  - Lists
  - Basic Operators
  - String Formatting
  - Basic String Operations
  - Conditions
  - Loops
  - Functions
- 3. Each section presents you with theory, code to run and exercises to try out.
- 4. If you want to practice writing your own python programs you can download and install a simple python development tool here: <u>https://www.python.org/downloads/</u>

#### Additional note:

This task is most suited to students who intend to do the A Level and have not previously gained much / or any programming experience from the GCSE Computer Science course.

Although the language chosen here is Python, and that may not be what you will be using at A Level, it is the underlying programming concepts which are important.

The list of topics above cover the standard set of programming concepts you would be expected to know having completed a GCSE and Computer Science and so will prepare you well for the A level.







### Why is Computer Science important?

#### Expected time to complete: 2 hours

It is easy to say, "Computer Science is essential in todays world", but are you able to think critically about this statement and back it up? "Thinking Critically" is an essential skill at A Level. It involves you:

- Looking at a topic / concept in depth
- Taking account of different views / perspectives
- Considering positives and negatives
- Evaluating links and effects on other concepts
- Drawing your own conclusions backed up with evidence
- 1. On the following slide answer the questions:
  - What is Computer Science?
  - What are the benefits and risks of Computer Science at a local level (think about your local community / town / city / county)
  - What are the benefits and risks of Computer Science at a national level
  - What are the benefits and risks of Computer Science at a global level

#### Additional help:

For additional help and support in structuring your answer you might like to watch some of the videos from the following Craig 'n' Dave playlists:

OCR: SLR 17 – Ethical, morale and cultural issues https://student.craigndave.org/videos/slr-17-ethical-moral-and-cultural-issues

AQA: SLR 19: Moral, social, legal, cultural issues <u>https://student.craigndave.org/videos/slr19-moral-social-legal-cultural-issues</u>

## Critical thinking task



## Why is Computer Science important?

Expected time to complete: 2 hours

