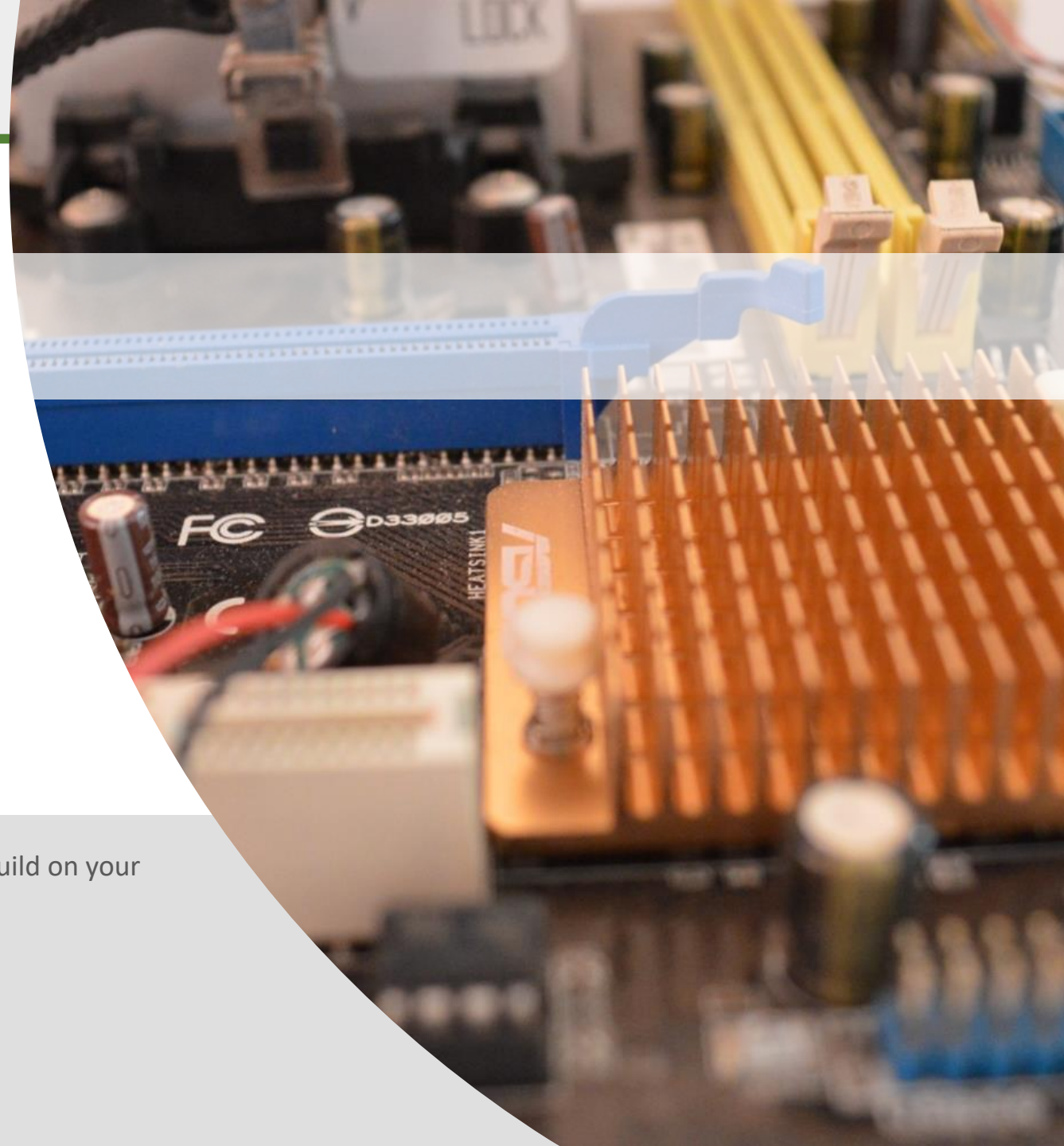
Computer Science Transition workbook



- 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.

1 “Tell me about yourself”

Craig’n’Dave

Why did you choose Computer Science?

Expected time to complete: ½ 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?

2 Independent research task

Craig'n'Dave

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 cars
- 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

3 What is “computational thinking”?

Craig’n’Dave

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:
   - https://student.craigndave.org/specification-key-terminology-and-cheat-sheets

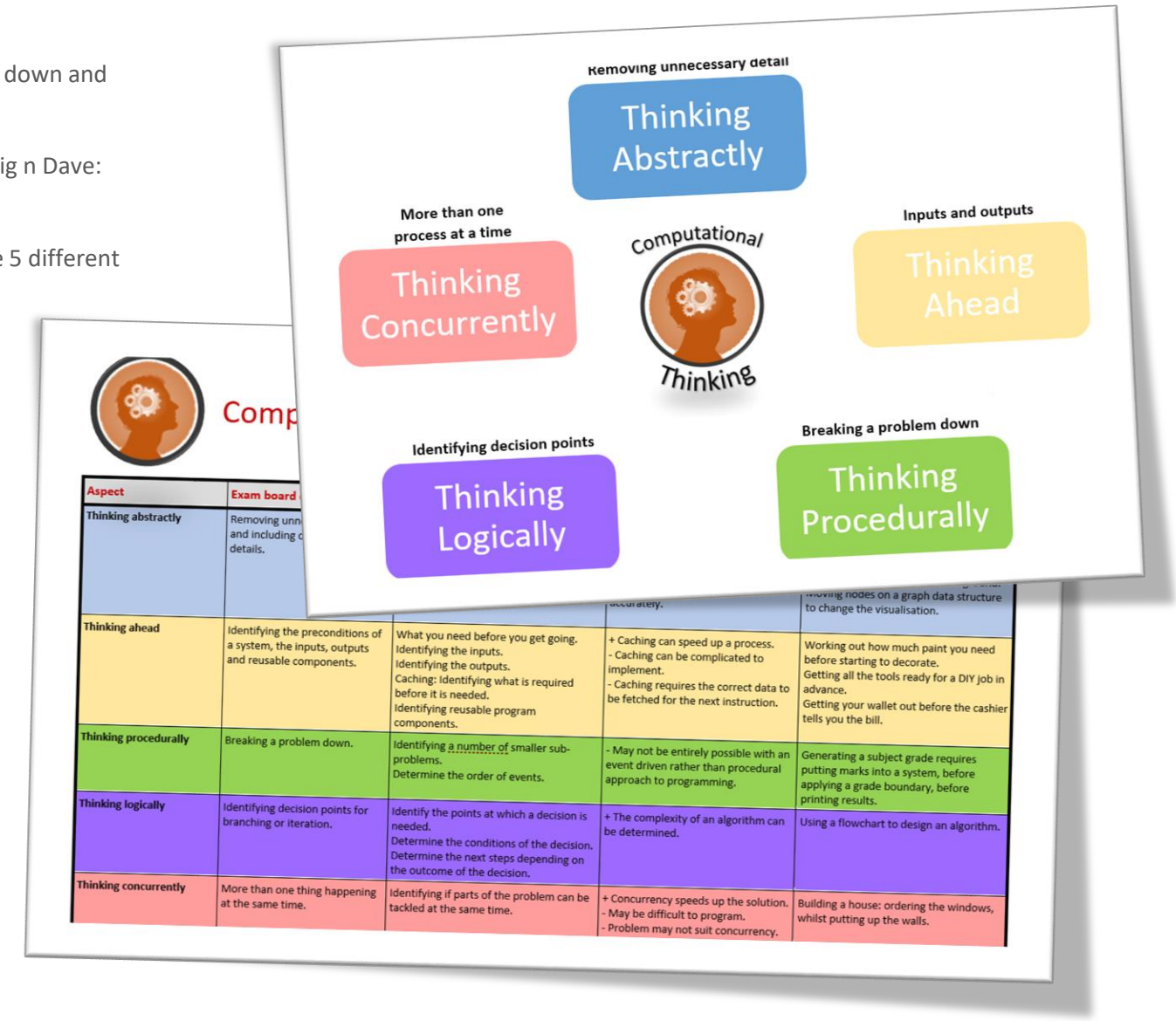
2. Create your own spider diagram / mind map which shows your clear understanding of the 5 different computational thinking strands
   - Keep it to a single side of A4 / A3

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.



Aspect	Exam board			
Thinking abstractly	Removing unn and including details.		accurately.	moving nodes on a graph data structure to change the visualisation.
Thinking ahead	Identifying the preconditions of a system, the inputs, outputs and reusable components.	What you need before you get going. Identifying the inputs. Identifying the outputs. Caching: Identifying what is required before it is needed. Identifying reusable program components.	+ Caching can speed up a process. - Caching can be complicated to implement. - Caching requires the correct data to be fetched for the next instruction.	Working out how much paint you need before starting to decorate. Getting all the tools ready for a DIY job in advance. Getting your wallet out before the cashier tells you the bill.
Thinking procedurally	Breaking a problem down.	Identifying a number of smaller sub-problems. Determine the order of events.	- May not be entirely possible with an event driven rather than procedural approach to programming.	Generating a subject grade requires putting marks into a system, before applying a grade boundary, before printing results.
Thinking logically	Identifying decision points for branching or iteration.	Identify the points at which a decision is needed. Determine the conditions of the decision. Determine the next steps depending on the outcome of the decision.	+ The complexity of an algorithm can be determined.	Using a flowchart to design an algorithm.
Thinking concurrently	More than one thing happening at the same time.	Identifying if parts of the problem can be tackled at the same time.	+ Concurrency speeds up the solution. - May be difficult to program. - Problem may not suit concurrency.	Building a house: ordering the windows, whilst putting up the walls.

4 Note taking practice task

Craig'n'Dave

The Cornell method of note taking

Expected time to complete: 1½ hours

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:
   - https://craigndave.org/cornell-note-taking/

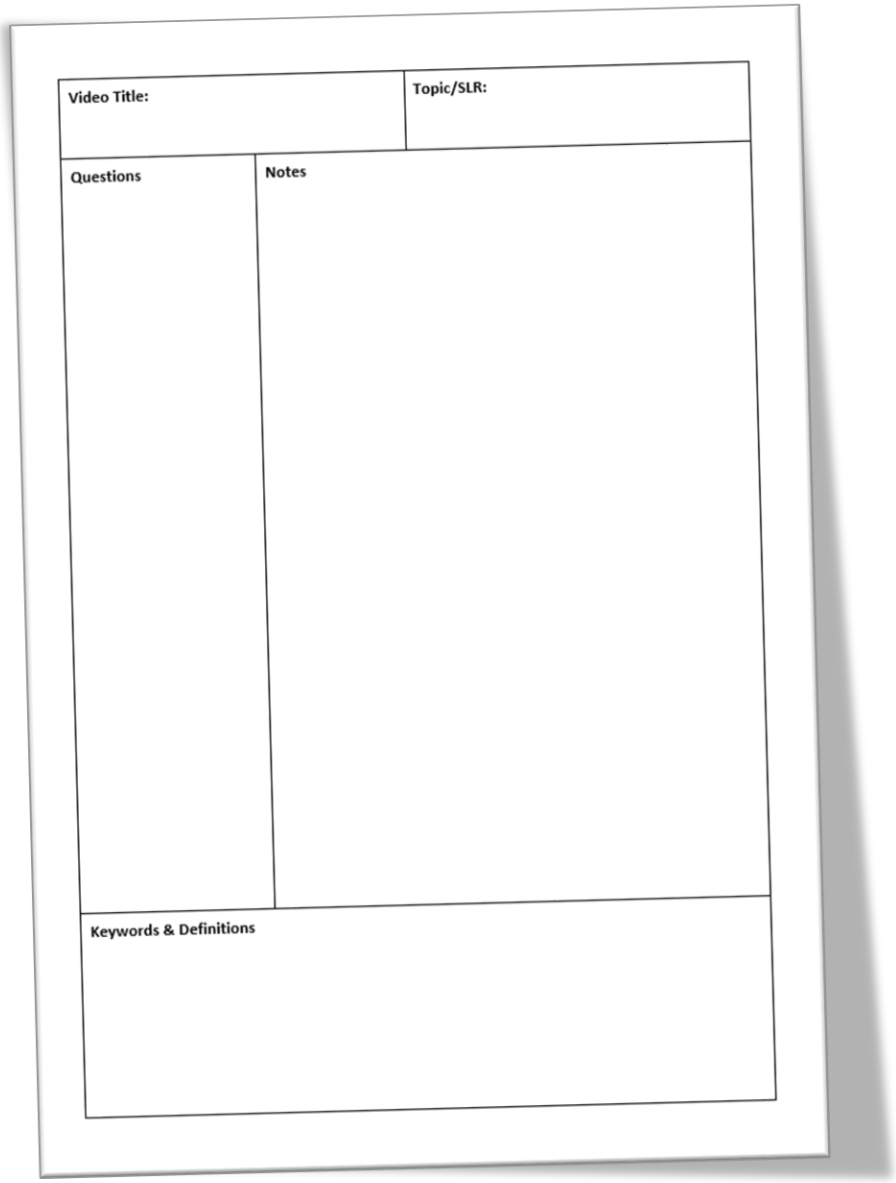
2. Pick any two of the following videos from Craig 'n' Dave:
   - OCR: https://student.craigndave.org/videos/ocr-alevel-slr01-alu-cu-registers-and-buses
   - OCR: https://student.craigndave.org/videos/ocr-alevel-slr04-paging-segmentation-and-virtual-memory
   - OCR: https://student.craigndave.org/videos/ocr-alevel-slr05-stages-of-compilation
   - 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.

6. Finally pull out all the key words and their definitions words the notes and list them in the bottom section.



5 Key terms task

Craig'n'Dave

Getting to grips with terminology

Expected time to complete: 2 hours

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?

6 An introduction to the basics of programming tasks

Craig'n'Dave

Programming basics

Expected time to complete: 6 hours

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: https://www.learnpython.org/
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: https://www.python.org/downloads/

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.

7 Critical thinking task

Craig'n'Dave

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

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7 Critical thinking task

Craig'n'Dave

Why is Computer Science important?

What is Computer Science?

- Enter your answer here

What are the benefits and risks of Computer Science at a local level

- Enter your answer here
- Try to make at least 4 valid points
- At least 2 of your points should be about the potential risks of Computer Science
- At least 2 of your points should be about the potential benefits of Computer Science

What are the benefits and risks of Computer Science at a national level

- Enter your answer here
- Try to make at least 4 valid points
- At least 2 of your points should be about the potential risks of Computer Science
- At least 2 of your points should be about the potential benefits of Computer Science

What are the benefits and risks of Computer Science at a global level

- Enter your answer here
- Try to make at least 4 valid points
- At least 2 of your points should be about the potential risks of Computer Science
- At least 2 of your points should be about the potential benefits of Computer Science