**SUMMER TASKS – GCSE TO A LEVEL TRANSITION**

|  |
| --- |
| **Subject: A Level Computer Science** |
| **Title: Computer Science workbook** |
| **Task(s):** **Complete the tasks as indicated in the workbook below** |
| **How long should I spend on this?** **You should spend at least 3 hours on this work. You could spend longer if you want to think or research more deeply** |
| **How will I get feedback?** **When you submit to MS Teams, feedback will be available there (you will get a login upon enrolment)** |
| **Contact email:** vroddis@yorkcollege.ac.uk |



**A Level Computer Science**

**Summer Workbook**

Please complete the tasks below ready to submit as soon as you start college.

You are advised to do these using a word processor (eg LibreOffice, Word, Google Docs) in this document. If you have problems accessing this, email vroddis@yorkcollege.ac.uk

If you get stuck, try to solve the problem; otherwise move on to the next task. Have fun!

Like a true computer scientist, you’ll need to draw on logic and your understanding of reasoning, you’ll need to use your imagination and think creatively, and do some online research. Combining good research with logical thinking gives a computer scientist a solid foundation. Adding imagination and creativity can find real solutions to difficult problems.

Good luck, and the team look forward to welcoming you to the course in September.

Val Roddis

A Level Computer Science Course Leader

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# Thinking Logically

Thinking logically is about **identifying when and how decisions are made**. In a computer this often leads to branching**,** where a different action will occur depending on ***IF*** a particular condition is met

Decisions will determine how a program progresses and how a problem is solved. For example:

## Sudoku

Sudoku is a popular logic puzzle commonly characterised by 9 grids of 3x3 squares.

The only rules are that **each of the rows and columns and each of the 3x3 grids can contain the numbers between 1 and 9 only once**. A simple example (using smaller grid sizes and the numbers 1-4 to make it easier):

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2 | 4 |  |
| 1 |  |  | 3 |
| 4 |  |  | 2 |
|  | 1 | 3 |  |

How would you go about solving this problem? What steps would you take?

* First
* Next
*
*
*
* Finally

If you are new to Suduku try to find a good video to explain.

 Then complete this:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 | 3 |  |  | 7 |  |  |  |  |
| 6 |  |  | 1 | 9 | 5 |  |  |  |
|  | 9 | 8 |  |  |  |  | 6 |  |
| 8 |  |  |  | 6 |  |  |  | 3 |
| 4 |  |  | 8 |  | 3 |  |  | 1 |
| 7 |  |  |  | 2 |  |  |  | 6 |
|  | 6 |  |  |  |  | 2 | 8 |  |
|  |  |  | 4 | 1 | 9 |  |  | 5 |
|  |  |  |  | 8 |  |  | 7 | 9 |

If you get stuck, there is a list of tactics at this page: <http://www.paulspages.co.uk/sudoku/howtosolve/index.htm>

**Optional extension**

How might you start to make a program to solve any Sudoku puzzle? What sort of data structures would you use? Would the computer be able to do everything that you did to solve the problem?

Many people have already implemented the code for this, although they may all take different approaches. One person is <http://norvig.com/sudoku.html>

# Thinking Abstractly

An abstract is a summary of a situation with **unnecessary detail removed.** To solve a problem it is important to focus on only the elements that are essential to the problem situation. Here is an example

## Activity Map

The image below represents the size and relative position of 6 different countries. You will notice the name, culture and all geographical features are not represented, as the problem relates only to depicting the borders.



Colour the map above, making sure that countries that share a border are not the same colour. You should also try and **use as few colours as possible**.

How many colours did you need?

How can you be sure?

# Thinking Procedurally

When planning a program we need to think about what sequence to perform tasks, and what resources (or inputs) are needed. Sometimes we may need to repeat a process

## Flow Chart

A flow chart is a diagram used to show the logical steps to be taken in a procedure. Here’s one to make a cup of tea:



All resources are taken from <https://www.twinkl.co.uk/teaching-wiki/flow-chart> which you could use for reference

Create your own flow chart to show the actions you would take to get to college (don’t forget to put on your ID card) badge!) You could draw this by hand or use an app such as <https://app.diagrams.net/>

Adapt this box to suit the size of your chart

Try to include a decision and a loop if possible

# Thinking Ahead

Thinking ahead is about considering the **inputs and outputs for a situation and the best way to store them**.

## Binary counting

Binary is key to CS. Can you write out the binary for the first 10 numbers?

1. 00000001
2.
3.
4.
5.
6.
7.
8.
9.

Can you add the binary numbers 1010 and 1101? Show your working

**Greater Depth**

Can you take away one number from the other? What issues do you discover

# Being current

CS is a subject that is constantly changing. You need to use reliable websites and search techniques to find reliable and relevant information. The law, and ethical issues are key also to your studies.

You are going to **research a Computer Science topic that interests you (it could be cybersecurity, new technology, augmented reality or whatever interests you)**

## Research Process

Describe the process you would use to find a reliable web source for a Computer Science topic that interests you (it could be hacking, new technology, augmented reality or whatever interests you

1. First I would open ….
2.
3.
4. To check it was up to date, reliable and accurate I would:
	1.
	2.
	3.

Now put the urls of sites you have used in a list here. The first two are suggestions you could use as a starting point:

<https://www.bbc.co.uk/news/technology>

<https://www.computerweekly.com/>

## New technology research

1. In **your own words** (please do not use AI) write around 500 words explaining:
* I chose x technology because…..
* It may impact individuals and society in the future by …..
* Technically, the technology involves (explain its key elements and a general overview of how it works)
1. Create a landscape poster illustrating your technology (you could use google slides, MS Word or any suitable drawing package) You will need to submit a pdf The poster should include:
	1. A title and professional layout
	2. 2-3 appropriate images illustrating the technology and its use
	3. a text box of 3-4 brief bullets summarising its potential impact
	4. a text box of 3-4 brief bullets with some technical detail of how it works elements