HIGH STORRS SIXTH FORM BRIDGING WORK

HIGH STORRS SCHOOL
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2023

Computer Science

High Storrs School
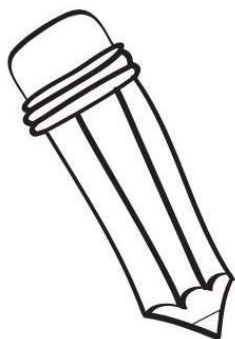
A-Level Computer Science Bridging Project

You should complete your work on MS Word

File name: A-Level CS Bridging Unit

Submit your report to Mr Davies on Thursday 7th September

Computer Science is a practical subject where you will apply the academic principles learned in the classroom to real world systems. It is an intensely creative subject that combines invention and excitement, and can look at the natural world through a digital prism. OCR's A Level in Computer Science will value computational thinking, helping you to develop the skills to solve problems, design systems and understand the power and limits of human and machine intelligence.

This bridging project has two parts, a programming challenge and a research project.

Part 1 – Programming challenge ◀

Choose **1** of the following challenges and solve it using:

- A flowchart

- Pseudocode

- Programme code (any high-level language will do, you may wish to try out a different language to test yourself, but Python is fine)

Pre-task profile question:

Tell us about your background in Computing, your last school, what languages you know and what you hope to learn from this course.

Challenge 1:

Useful Resources:

Password reset program

Only accept a new password if it is:

1.   At least eight characters long
2.   Has lower case and upper case letters.

The password reset program should also make the user input their new password twice so that the computer knows that the user has not made any mistakes when typing their new password.

Extensions:

1. Make some sort of algorithm to suggest how strong the password is (Weak, Medium, Strong) depending on length, whether or not the password has special characters in etc.
2. Let the user input their username. The program should go to a text file with a list of usernames and old passwords, and the program should only let you change your password if you input your old password.

- **OCR Python Guide**
  https://www.ocr.org.uk/Images/390478-programming-techniques-python-teacher-guide.docx
- **OCR Pseudocode guide**
  https://www.ocr.org.uk/Images/260952-pseudocode-guide.pdf

Challenge 2:

Useful Resources:

Text based game

Create a text-based game like Zork. Have the programme take the users name and use it to tell the story. Have the programme allow a non-linear progression through the various rooms. The user should have at least 2 choices per room. You will want to plan this one with a flowchart first!

Extension:

• Have each room as a separate function.

• Add an inventory system so you must collect a key to get through a certain door etc.

https://classicreload.com/zork-i.html

- **OCR Python Guide**
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- **OCR Pseudocode guide**
  https://www.ocr.org.uk/Images/260952-pseudocode-guide.pdf

Notes:

- You should make sure your project has robust validation making it hard to break
  - Look into how to stop crashes when letters are input when you are expecting numbers, and vice versa.
- Your code should use functions and procedures to make it more efficient. (remember that you must pass variables across to the functions or you could crash the program saying it isn't defined)
- Your code should be commented
- Where possible make use of external files
  - In Challenge 1 store the username and passwords in either the same or even different files
  - In challenge 2, consider having some sort of inventory, or health stats – this can get really big, really quick, but experiment, we don't mind if some of it doesn't work, but use it as an opportunity to problem solve and hone and improve your programming skills 😊

Part 2 – Research project

Same as before, choose 1 of the following:

Types of processor

Research and explain the main features of the **Von Neumann Architecture** and the **Harvard Architecture**. Draw suitable diagrams for each, identifying the main differences.

Next, look into the differences between **RISC** and **CISC** Processors, draw out tables to show the differences between the two.

Finally, Research into the uses of **GPUs**, obviously graphics, but what else?

Legal, Moral, Ethical and Cultural Issues

Networking sites frequently feature angry, violent or inaccurate content.
Should Facebook, Twitter, Ask.com and others take responsibility for content posted on their sites? What sort of content should be allowed? Would it be possible to develop software to facilitate such a task? Discuss.

Some of the jobs likely to disappear over the next decade owing to computerisation include manufacturing jobs, clerical jobs and even service jobs, where people will be replaced by robots. Give examples of other jobs which may be lost owing to computerisation. What will be the social effects of the job losses?

Algorithms

Research into 'Big O Notation' and how it is used within algorithms
Next Research into 'Dijkstra's Shortest Path' and also the A* Algorithms.

Note down how these algorithms compare to those you studied at GCSE.

Want more?

There are currently a lot of free resources floating around the internet waiting to be explored. Have a look into:

This is a link to a lot of university standard courses you might want to consider dipping into:
https://www.classcentral.com/report/new-courses-october-2018/?fbclid=IwAR3N6Nfc_sH9fC_0dMT_C2CgJOleD5HWKrtA8dFleYx4sIu1h1ZycfzhunI

YouTube tutorials – there are so many programming languages out there, and Repl is a great place for you to practice them. Choose a language, choose a tutorial and give it a go. Maybe try HTML, CSS and JavaScript if you fancy trying some web development?

App Inventor and App Lab – Give these a looksee if you fancy trying some app development.

Ask us – if you are unsure what else to do, but want to do more, ask us and we'll give you some ideas; admittedly, Mr D. will probably just tell you to go and do some gardening, but it's worth a try right!?

Any issues?

Mr Davies: m.davies@highstorrs.sheffield.sch.uk Mr Parry: sparry@chapeltownacademy.com

Recommended reading/books for this course:

OCR AS and A Level Computer Science:

PM Heathcote and RSU Heathcote ISBN:
978-1-910523-05-6

These textbook covers Component One and Two of the A Level course and also has a section on Completing Component Three.

Tackling A Level projects in Computer Science OCR H446: Ceredig Cattanach-Chell
ISBN: 978-1-910523-19-3

This is an extensive how-to guide on completing the programming project. Starting with how to choose a project to work on and then how to write about it. It has been written by one of the OCR team who has been heavily involved with the creation of the GCSE and A-Level Computer Science specification.

Essential algorithms for A Level Computer Science:

D Hillyard and C Sargent ISBN:
978-1-794359-42-0

This book details all of the algorithms and data structures that you need to know for the A Level course. Each algorithm has visual representations, pseudocode examples and working Python and Visual Basic code examples.

OCR A Level Computer Science
George Rouse, Jason Pitt, Sean O'Byrne ISBN:
9781471839764

This book develops a problem-solving approach based on computational thinking using thought -provoking practice questions at the end of each chapter.

Useful websites:

101 Computing

https://www.101computing.net/category/a-level-concepts/ W3Schools

https://www.w3schools.com/ PacktPub

free learning

https://www.packtpub.com/free-learning
https://www.youtube.com/playlist?list=PL8dPuu

Crash Course Artificial Intelligence

https://www.youtube.com/playlist?list=PL8dPuua