

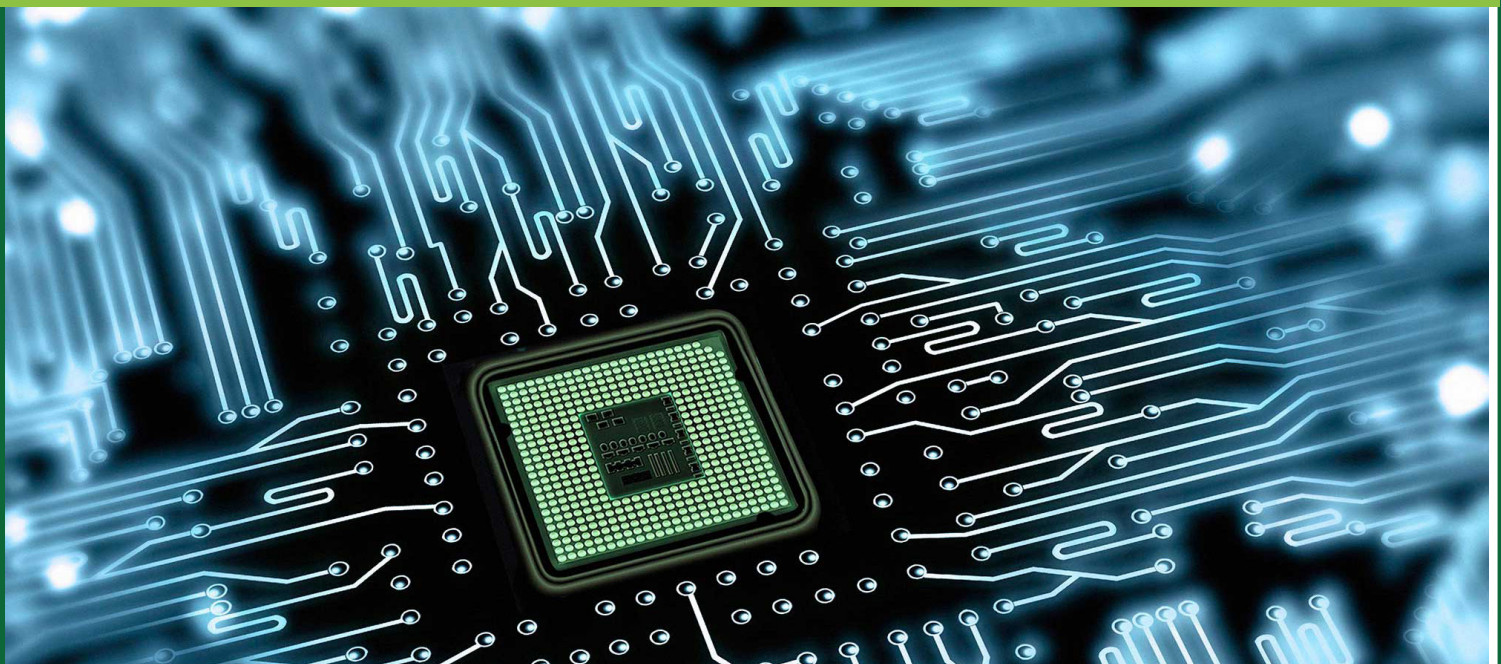


Bentley Wood

High School for Girls

Computer Science GCSE to A-level

Bridging Work
Year 11 into 12 for 2024/25



Name: _____

Tutor Group: _____

Teacher: _____

A LEVEL COMPUTER SCIENCE

Name:



OCR A Level Computer Science
Summer Bridging Work 2024
Year 11 into 12



A Level Computer Science

The purpose of our bridging work is to best prepare you for the academic year 2024/25 and this will support you on the A level Computer Science course. This is for all Computer Science students to be completed for September 2024.

To best prepare you, please remember the following items for EVERY lesson –

ESSENTIAL:

- Folders
- Exercise book
- Equipment (pens- green/purple)

A Level Computer Science - Course

Learners must take three components (01, 02 and 03 or 01, 02 and 04) to be awarded the OCR A Level in Computer Science.

| Content Overview | Assessment Overview | |
|--|--|---|
| <ul style="list-style-type: none"> • The characteristics of contemporary processors, input, output and storage devices • Software and software development • Exchanging data • Data types, data structures and algorithms • Legal, moral, cultural and ethical issues • Elements of computational thinking • Problem solving and programming • Algorithms to solve problems and standard algorithms <p><i>The learner will choose a computing problem to work through according to the guidance in the specification.</i></p> <ul style="list-style-type: none"> • Analysis of the problem • Design of the solution • Developing the solution • Evaluation | <p>Computer systems (01)</p> <p>140 marks</p> <p>2 hours and 30 minutes</p> <p>written paper</p> <p>(no calculators allowed)</p> | <p>40%</p> <p>of total</p> <p>A level</p> |
| | <p>Algorithms and programming (02*)</p> <p>140 marks</p> <p>2 hours and 30 minutes</p> <p>written paper</p> <p>(no calculators allowed)</p> | <p>40%</p> <p>of total</p> <p>A level</p> |
| | <p>Programming project 03* – Moderated upload or 04* – Moderated postal or 80 – Carry forward (2018 onwards)*</p> <p>70 marks</p> <p>Non-exam assessment</p> | <p>20%</p> <p>of total</p> <p>A level</p> |

To support you on the course, or you have any questions, please contact your teachers for the course next academic year:

| | |
|---------------|--|
| Mr. N Khan | Nkhan@bentleywood.harrow.sch.uk |
| Miss. L North | LNorth2@bentleywood.harrow.sch.uk |

A Level Computer Science – Online Resource

The following online resources are helpful to support you on the course.

Student Revision Checklist:

<https://craigndave.org/wp-content/uploads/2017/05/Student-revision-checklist-AS-A-LEVEL.docx>

A Level Computer Science Specification:

<https://www.ocr.org.uk/images/170844-specification-accredited-a-level-gce-computer-science-h446.pdf>

Craig and Dave - Videos

<https://student.craigndave.org/h046-h446>

Exam Technique – Part 1 to 4:

<https://www.youtube.com/watch?v=skTUGgD2ThE>

<https://www.youtube.com/watch?v=wxuOtKfAIRI>

<https://www.youtube.com/watch?v=HVwk2jXG6cs>

<https://www.youtube.com/watch?v=vWzI2hsfIOU>

CS News – A Level Computer Science – Programming Content

<https://www.csnews.com/programming>

Computer Science Theory

Recommended resources

| | |
|---|--|
| http://student.craigndave.org/ | By far, the best site you will find for this A-Level. Take a look at the videos section for videos on every topic of the course! |
| http://www.mrfraser.org/ | You will have to create an account, but the resources here are excellent and well explained |
| http://www.advanced-ict.info/theory/NC/index.html | Although aimed at GCSE, there are some good resources on here, especially with programming, HTML and JavaScript |

| | |
|---|---|
| https://projecteuler.net/archives | Project Euler is a series of challenging mathematical/computer programming problems that will require more than just mathematical insights to solve. Although mathematics will help you arrive at elegant and efficient methods, the use of a computer and programming skills will be required to solve most problems |
| http://challenge.bebas.uk/ | UK Bebras Challenge 2019 The 2020 challenges take place between 2nd and 13th November. The aim of the Challenges: Solve as many problems as you can in 40 minutes. You are not expected to finish! |
| https://en.wikibooks.org/wiki/A-level_Computing/AQA | This is an outstanding resource for all things Computer Science. It is based on the AQA spec but there is a lot of overlap |
| https://en.wikibooks.org/wiki/A-level_Computing/OCR | This is similar to the AQA website above, but there are a lot of unfinished parts. |
| https://robjonescowley.wordpress.com/resources/ | Some Raspberry Pi resources for you to try |
| http://gcsecs.weebly.com | Although for GCSE and AQA AS, there are a lot of useful resources on this site |
| http://a2computing.as93.net/ | Although for an older spec, there are a lot of relevant materials here |
| https://www.physicsandmathstutor.com/computer-science-revision/a-level-ocr/ | A complete set of revision notes, questions and videos for the OCR AS and A-Level spec |

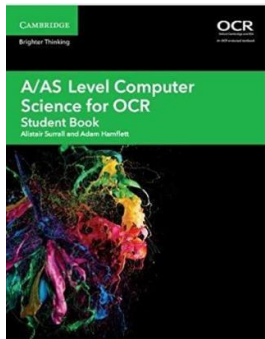
Recommended Books



OCR AS and A Level Computer Science Paperback – 12 Sep 2016

From https://www.amazon.co.uk/OCR-AS-Level-Computer-Science/dp/1910523054/ref=sr_1_8?ie=UTF8&qid=1499442116&sr=8-8&keywords=ocr+computer+science+a+level

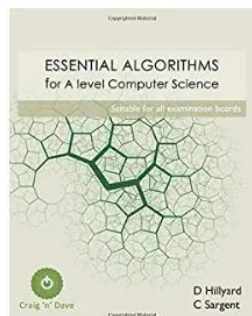
The best book for this course. It is very detailed and has all the information you will need for your AS and A Level exams. This is the core text book for the course and the one we will be referring to during teaching so it is recommended you purchase a copy of this book



A/AS Level Computer Science for OCR Student Book (A Level Comp 2 Computer Science OCR) Paperback – 5 Oct. 2017

From https://www.amazon.co.uk/Level-Computer-Science-Student-Book/dp/1108412718/ref=sr_1_1?dchild=1&keywords=a+level+computer+science&qid=1588246283&sr=8-12

Another very good book which covers both the AS and A Level course. Well written and with plenty of examples this is a good alternative to the core text book.



Essential algorithms for A Level Computer Science Paperback – 21 Feb.2019

From https://www.amazon.co.uk/Essential-algorithms-Level-Computer-Science/dp/1794359427/ref=sr_1_7?dchild=1&keywords=a+level+computer+science&qid=1588256711&sr=8-7

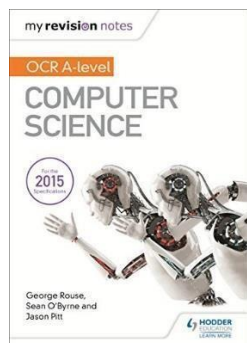
This book focuses specifically on the algorithms aspect of the course and goes through some of the most challenging algorithms you have to learn in great detail with clear explanations as well as coded examples in pseudocode, Python and Visual Basic. You will be given a free full .pdf version of this book but you can purchase a printed copy



OCR A Level Computer Science by George Rouse (24-Apr- 2015) Paperback Paperback – 1600

From https://www.amazon.co.uk/d/Books/Level-Computer-Science-George-Rouse-2015-Paperback/B011T7IG8K/ref=sr_1_1?ie=UTF8&qid=1499442048&sr=8-1&keywords=ocr+computer+science+a+level

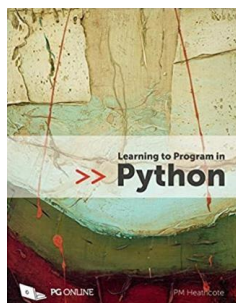
Not the best book to get. I would recommend against purchasing this but if you find a cheap version somewhere, it does have some useful bits



My Revision Notes OCR A level Computer Science Paperback – 25 Mar 2016

From [https://www.amazon.co.uk/Revision-Notes-level-Computer-](https://www.amazon.co.uk/Revision-Notes-level-Computer-Science/dp/1471865835/ref=tmm_pap_swatch_0?encoding=UTF8&qid=1499442116&sr=8-5)

[Science/dp/1471865835/ref=tmm_pap_swatch_0?encoding=UTF8&qid=1499442116&sr=8-5](https://www.amazon.co.uk/Revision-Notes-level-Computer-Science/dp/1471865835/ref=tmm_pap_swatch_0?encoding=UTF8&qid=1499442116&sr=8-5) Good for condensed notes when it comes to revision

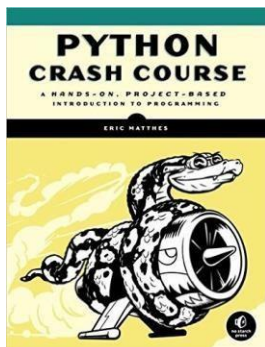


Learning to Program in Python 2017 Paperback – 23 Jun. 2017

From [https://www.amazon.co.uk/Learning-Program-Python-2017-](https://www.amazon.co.uk/Learning-Program-Python-2017-Heathcote/dp/1910523119/ref=sr_1_1?crid=111Y81GSH3V2K&dchild=1&keywords=python+heathcote&qid=1588257461&srefix=python+heat%2Caps%2C358&sr=8-1)

[Heathcote/dp/1910523119/ref=sr_1_1?crid=111Y81GSH3V2K&dchild=1&keywords=python+heathcote&qid=1588257461&srefix=python+heat%2Caps%2C358&sr=8-1](https://www.amazon.co.uk/Learning-Program-Python-2017-Heathcote/dp/1910523119/ref=sr_1_1?crid=111Y81GSH3V2K&dchild=1&keywords=python+heathcote&qid=1588257461&srefix=python+heat%2Caps%2C358&sr=8-1)

A good Python programming book to get if you are new to Computer Science or need to get yourself up to speed for programming at AS level



Python Crash Course: A Hands-On, Project-Based Introduction to Programming

This book will teach you a little bit more than the Easy Steps book. We have a copy in the department if you would like to borrow it

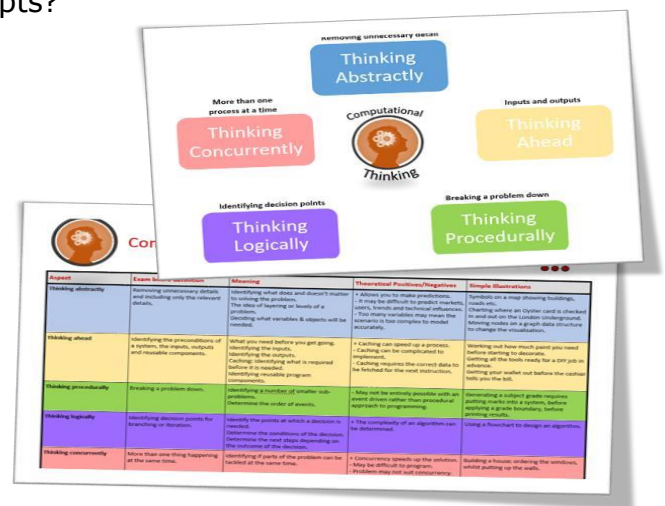
What is Computational Thinking?

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.

- Download the "Computational thinking and Computational methods placemats" from Craig n Dave:
 - <https://student.craigndave.org/specification-key-terminology-and-cheat-sheets>
- 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
- 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.



System Architecture Task

Looking under the hood of the processor

1. The CPU "Central Processing Unit" is the central core of any computer system. You will study what it contains and how it works it in depth at A Level.
2. Start by watching the following 3 videos from Craig 'n' Dave:
 1. <https://student.craigndave.org/videos/ocr-alevel-sl1r01-alu-cu-registers-and-buses>
 2. <https://student.craigndave.org/videos/ocr-alevel-sl1r01-fetch-decode-execute-cycle>
 3. <https://student.craigndave.org/videos/ocr-alevel-sl1r01-performance-of-the-cpu>
3. Produce a fully annotated diagram on a single sheet of A4 / A3 paper which shows how the CPU works.
4. Make sure the diagram includes and covers:
 - Major CPU components and what they are for:
 - Arithmetic Logic Unit (ALU)
 - Control Unit (CU)
 - Cache
 - The main registers
 - Program Counter (PC)
 - Memory Address Register (MAR)
 - Current Instruction Register (CIR)
 - Memory Data/Buffer Register (MDR / MBR)
 - Fetch-decode-execute cycle
 - Include annotations which explain how the performance of a CPU can be improved by:
 - Increasing the clock speed
 - Increasing the cache size
 - Increasing the number of cores

Network - Task

Types of Network:

Carry out some research on computer networks, in particular LANs, WiFi, Network topologies and connectivity devices. Use the symbols on the right (feel free to revise them) to create an appropriate network over the floorplan on the next slide.

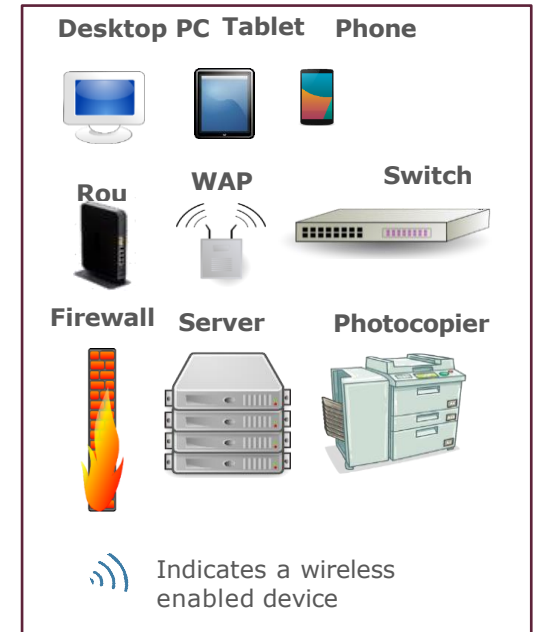
Make sure your network meets all the following requirements:

1. Each member of the main office needs a desktop PC
2. Angela, Pam, Dwight and Oscar also use an office issued smart phone

The following rooms new access to WiFi:

1. Meeting room (top right)
2. Reception
3. Conference Room
4. Main office
5. Use a circle with a transparent fill (so you can see the network underneath) with a width and height of 12.5cm to provide the WiFi coverage needed to cover the rooms above:
 - a. The circles need to have a WAP at the centre
 - b. The 12.5cm diameter circles represent the maximum range of each WAP
 - c. They WAP icons must be attached to a wall
 - d. You must use the minimum number of WAP possible to provide the coverage needed
6. All desktop PCs use wired connections in a star network configuration
 - i. The top left server room, conference room and main office need to be on one subnet with its own switch
 - ii. All other rooms are on a separate subnet and will require its own hardware for this
 - iii. The two subnets need to be appropriately connected together
7. The top left room needs to have a server placed in it and connected appropriately to the local subnet
8. The server room needs hardware to appropriately connected the LAN to "The Internet"
9. Reception needs a photocopier and it needs connecting to the local subnet
10. A firewall should be placed somewhere appropriate

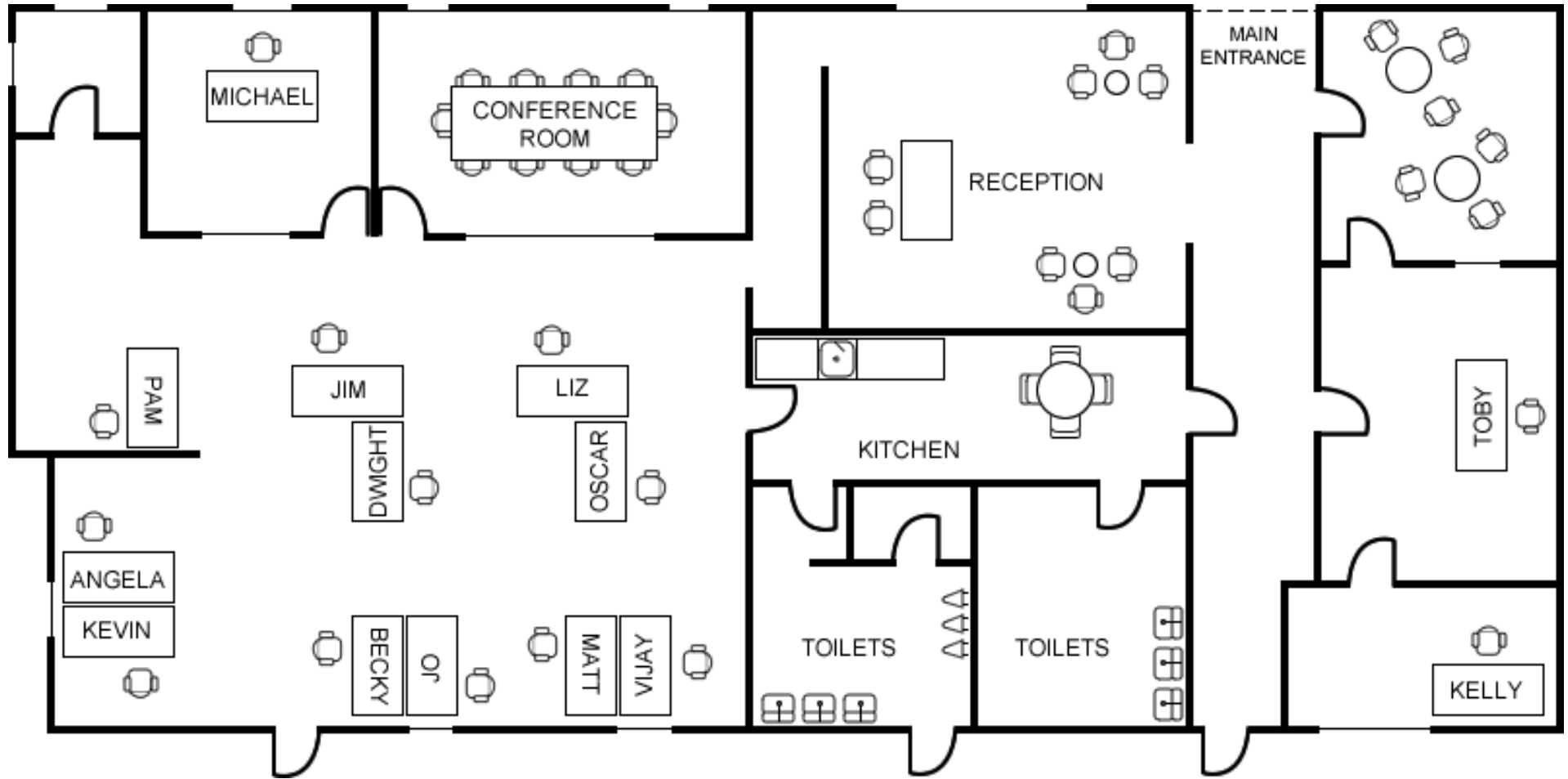
Use the following symbols:



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 11 – Networks

<https://student.craigndave.org/videos/slr-11-networks>



Linear Search Programming Task

Algorithms: From Theory to Practise

1. A core concept of computer science is that of data structures and algorithms.
2. It is also an area which many students struggle with during examinations.
3. Probably the most basic algorithm is that of the "linear search".
4. If you have done the GCSE course you will have learnt about this searching algorithm already. Start by learning or refreshing your knowledge of the linear search algorithm by using the videos on this page:
 - <https://www.craigdave.org/algorithms-linear-search>



Once you are happy with the theory complete the exercises on the following slides.

Answer the following questions using an A4 paper:

Question 1: Describe what the linear search algorithm does.

Question 2: What are the applications of the linear search algorithm?

Question 3: Write out the steps of the linear search algorithm in simple-structured English.

Question 4: Write out pseudocode for the linear search algorithm.

- The algorithm should use an array called items which is pre-populated with the following values: "Florida", "Georgia", "Delaware", "Alabama", "California".
- The algorithm should ask the user to "Enter the state to find:"
- If the algorithm locates the state entered by the user in the array it should report back to the screen "Item found at position n"
- If the algorithms cannot locate the state entered by the user in the array it should report back to the screen "Item not found"

Programming Challenges

These challenges start off relatively easy then get notoriously difficult. Try to complete as many as you can

Section 1 (Grades 3-5)

Sing Along

Create a program that prints the lyrics to the song '10 green bottles' in as few lines of code as possible.

Extension:

Develop this program so that you can enter any starting number and it will count down from there

Name it

Have the programme ask for your name, age and form. Have it tell them the information back in the format: Your name is (blank), you are (blank) years old, and you are in form (blank).

Extension:

- Have the programme store this information in an external file

Arithmetic test

A primary school teacher wants a computer program to test the basic arithmetic skills of her students. Generate random questions (2 numbers only) consisting of addition, subtraction, multiplication and division.

The system should ask the student's name and then ask ten questions. The program should feedback if the answers are correct or not, and then generate a final score at the end.

Section 2 (Grades 5-7)

Tiler's mate

Tim has just launched his own company; Tim's Tiles and needs a program to work out the costs of jobs for his customers. Have the user enter the width and length of the floor and have the program calculate the total cost of tiles it would take to cover a floor plan using a cost entered by the user (per tile or metre²).

Extension:

- Use functions within your program
- Have the program offer different types of tiles with different costs and tell the user the cost.
- Have the programme take into account the cost of grout and labour to give a customer a quote with and without VAT.
- Write the quote to a file

Section 3 (Grades 7-9)

R@nd0m P@ssw0rd generator

Have the programme create random strong passwords mixing upper and lower case, symbols and numbers. Passwords should be 15 characters long.

Extension:

- Have the password also use ASCII characters
- Have the passwords stored in an external file

Reading for Pleasure

- A Brief History of Artificial Intelligence: What It Is, Where We Are, and Where We Are Going
https://books.google.co.uk/books?id=hjctEAAAQBAJ&newbks=0&hl=en&redir_esc=y
- A Citizen's Guide to Artificial Intelligence
https://books.google.co.uk/books?id=myAXEAAAQBAJ&newbks=0&hl=en&redir_esc=y
- Artificial You: AI and the Future of Your Mind
https://books.google.co.uk/books?id=pDwDEAAAQBAJ&newbks=0&hl=en&redir_esc=y
- The Alignment Problem: How Can Machines Learn Human Values?
https://books.google.co.uk/books?id=TdL2DwAAQBAJ&newbks=0&hl=en&redir_esc=y
- The Atlas of AI
https://books.google.co.uk/books?id=KfodEAAAQBAJ&newbks=0&hl=en&redir_esc=y
- Understanding the Digital World: What You Need to Know about Computers, the Internet, Privacy, and Security, Second Edition
https://books.google.co.uk/books?id=BWUGEAAAQBAJ&newbks=0&hl=en&redir_esc=y