Holyport College Sixth Form
Year 11 Transition Work
COMPUTER SCIENCE

TRANSITION TOPICS:

1. Boolean Logic and Set Theory

Boolean logic challenge The University of Surrey online resources and 'quiz' on Boolean algebra. Read the material, look at the examples, complete the problems then take the online quiz. Note AND is represented by . and OR by +. Venn diagrams will help to understand each of these rules

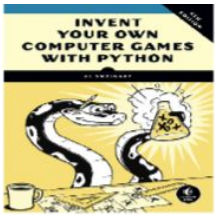http://www.ee.surrey.ac.uk/Projects/Labview/boolalgebra/

Wolfram demonstrations project

There is a downloadable utility to control a series of interactive demonstrations including several for Venn diagrams. For example, for simple two variable logic:

http://demonstrations.wolfram.com/VennDiagramsForTwoVariableBooleanLogicCircuits/

2. Data types, data structures and algorithms

Data types in A Level go more into depth such as use of Sign and Two's complement to represent negative numbers and representation of floating point numbers in binary as well as arithmetic of floating point values.

	Think Python Learning with Python 3 Peter Wentworth, Jeffrey Elkner, Allen B. Downey,Chris MeyersOct. 2012 http://openbookproject.net/thinkcs/python/english3e/index.html	One of the best free books on learning to program using python. The emphasis is on understanding why we write code and solve problems in a particular way, which is useful for A-level students.
	Invent with Python Albert Sweigart http://inventwithpython.com/	A nice way to start python, this site has a collection of introductory books on writing code, also all free! Each chapter has a game (or similar to make) and includes the full code, plus a step-by-step walkthrough of how to make it. It is a good exercise to read code before you write it, so making some of these games is useful.
	The British Informatics Olympiad https://www.olympiad.org.uk/problems.html	Lots of hard coding challenges. Like the maths challenge, only for programming!The Mayan Calendar is a good starting point.

PROGRAMMING TASKS:

Activity 1: Create a program that analyses a passage of text from a file and then counts: How many words, The average length of a word, How many times each word occurs, How many words start with each letter of the alphabet?

The aim of this exercise is to test your ability to develop algorithms

Activity 2: Complete one of the projects using Python from codeboom.

https://codeboom.wordpress.com/2012/07/30/10-mini-programming-projects/

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CODING CHALLENGES:

The coding challenges below will let you check your skills. Part of the transition to A-level is combining skills, and also ensuring that you plan and test your work thoroughly, so think about how you can reuse components and design your code for readability and robustness.

1. Challenge: Write an program to:
   a. Ask the user to input
      i. Their first name
      ii. Their surname
      iii. A date, in the format DD/MM/YYYY

   b. The program should then output a customer ID as follows:
      i. The date in the format YYYYMMDD, then the first three letters of the surname, then the first initial, then the length of their first name. All letters should be in capitals
      ii. For example, John Smith, 27/05/2017 would give 20170527SMITHJ4c. The program should validate any inputs and keep asking for inputs until the user enters correct details or types "quit" at any point.

   ● Plan your algorithm first, using a flowchart or pseudocode
   ● Code your algorithm, and provide evidence of both your code and the working output
   ● Create a test plan for your algorithm, including testing your validation with normal, boundary and erroneous data.

2. Challenge: Write a program to:
   a. Ask the user to input
      i. The name of a product
      ii. Its cost in pounds
      iii. The program should keep asking for inputs until the user types "None"

   b. The program should then output:
      i. The name and price of the most expensive item
      ii. The name and price of the least expensive item
      iii. The average price of the items
      iv. The total cost of the items
         1. Items over £50 get a 5% discount
         2. VAT is added at the end at 20%

   c. The program should validate any inputs

   ● Plan your algorithm first, using a flowchart or pseudocode
   ● Code your algorithm, and provide evidence of both your code and the working output
   ● Create a test plan for your algorithm, including testing your validation with normal, boundary and erroneous data.

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Enrichment Activities:

1. **National Museum of Computing**, Bletchley Park (Near Milton Keynes)
   http://www.tnmoc.org/
   https://www.bletchleypark.org.uk/
   http://www.codesandciphers.org.uk/bletchleypark/ (virtual tour)
The National Museum of Computing and the Bletchley Park code breaking exhibition are both on the same site, although each has a separate entrance fee. Huge range of technology to explore, including Colossus, the world's first electronic computer.

2. **Museum of Science and Industry,** Manchester http://msimanchester.org.uk/
The museum has an exhibition covering the development of computers, and they have "Baby" the world's first stored program computer. (There is an interactive talk about Baby every day.)
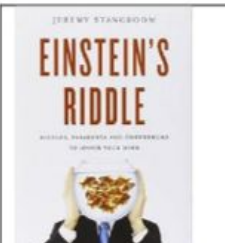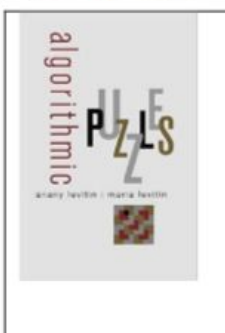
3. **Science Museum**, London http://www.sciencemuseum.org.uk/
A wide range of science and technology exhibitions. In particular, the museum is currently hosting an exhibition on robotics, charting our 500 year quest to make machines human.

4. **Centre for Computing History**, Cambridge http://www.computinghistory.org.uk/
A large collection of vintage and retro computers, with an emphasis on how computers have developed over time and the social context and impact of technological change.

Logic and Puzzle Activities

EINSTEIN'S RIDDLE	Einstein's Riddle Jeremy Stangroom Bloomsbury Publishing (18 May 2009) ISBN-10: 1408801493 ISBN-13: 978-1408801499	Contains the world's most famous logic puzzle
algorithmic PUZZLES	Algorithmic Puzzles Anany Levtin, Maria Levtin Oxford University Press, USA (14 Oct. 2011) ISBN-10: 0199740445 ISBN-13: 978-0199740444	A collection of puzzles designed to test and develop your algorithmic thinking and problem solving strategies. The book is well organised, with a discussion of each problem solving strategy and then several puzzles to practice.

Lots more of this style of puzzle, including interactive solving tools, can be found here:
http://www.logic-puzzles.org/index.php

Computer Science

Course Structure

Contents Overview

Component 1:
Computer Systems
- Processors
- Input/Output/Storage Devices
- Software & Software Dev.
- Exchanging Data
- Data Types, Data Structures
- Legal, Moral and Ethical issues

Component 2:
Algorithms and Programming
- Elements of Computational Thinking
- Problem Solving and Programming
- Algorithms to solve problems and standard Algorithms.

Component 3:
Programming Project
Choice of a computing problem to work through according to guidance in specification:

- Analysis of Problem
- Design of the Solution
- Developing the Solution
- Evaluation

Assessment Overview

Component (01)

140 marks
2 hr 30 mins

written paper

40 % of total A Level

Component (02)

140 marks
2 hr 30 mins

written paper

40 % of total A Level

Component (03)

70 marks

Non-Exam Assessment

20 % of total A Level

Examination Board: OCR

OCR
RECOGNISING ACHIEVEMENT