COMPUTER SCIENCE

Bentley Wood

High School for Girls

Year 10 into 11
GCSE Bridging Work

Aims of the bridging work

- The topic of Computer Science is at the heart of the modern world
- Studying it can make you extremely sought after in today's job market
- You would have noticed that the transition from Key Stage 3 to GCSE is significant, this includes:
    - An increased emphasis on technical content
    - An increased emphasis independent research

This pack is designed to allow you to practice some of the skills you learnt in year 10 and to develop new ones. Programming, like any other discipline needs to be practiced; little and often.

The bridging work is organized into three sections:
- Practical programming challenges
- Theory – research-based task
- Algorithms and programming

Useful Resources

https://www.csnewbs.com/python
https://wiki.python.org/moin/BeginnersGuide/Programmers
Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming Paperback – 9 May 2019
https://www.learnpython.org/

Contents

Section 1

The following programming challenges below range in difficulty from 1 to 10. With 10 being the most difficult. To successfully complete the challenges, you must create an algorithm for each task using either a flowchart or pseudocode. You must also program the task and provide print screen evidence of the program and the output.

Difficulty 1 Challenges

Difficulty Level									
1	2	3	4	5	6	7	8	9	10
✔									

Challenge 1

Design a program which asks the user to **input** their name, age and favourite colour.

You may need the following...			
Arithmetic	**Operations**	**Decisions**	**Iteration**
-	**BEGIN / END INPUT**	-	-

Algorithm	
Program	
Output	

The program asks the user to **input** their first name. The program then **outputs** the users first name.

Suggested Pseudocode Statements			
Arithmetic	**Operations**	**Decisions**	**Repetition**
-	**BEGIN / END**	-	-
	INPUT		
	OUTPUT		

Algorithm	
Program	
Output	

Challenge 3

The program asks the user to **input** their surname and then their first name. The program then **outputs** the user's first name and then their surname __separately__.

Suggested Pseudocode Statements			
Arithmetic	**Operations**	**Decisions**	**Repetition**
-	**BEGIN / END**	-	-
	INPUT		
	OUTPUT		

Algorithm	
Program	
Output	

Challenge 4

The program asks the user to **input** their first name and then their surname. The program then **outputs** the user's first name and then their surname **on the same line**.

Suggested Pseudocode Statements			
Arithmetic	**Operations**	**Decisions**	**Repetition**
-	**BEGIN / END**	-	-
	INPUT		
	OUTPUT		

Algorithm	
Program	
Output	

Challenge 5

Difficulty Level									
1	2	3	4	5	6	7	8	9	10
					✔				

A primary school teacher wants a computer program to test the basic arithmetic skills of her students. The program should generate a quiz consisting of a series of random questions, using in each case any two numbers and addition, subtraction and multiplication. The system should ask student's name, then ask 10 questions, output if the answer to each question is correct or not and produce a final score out of 10.

Scores from the quiz should be stored and added to when a student takes a new quiz.

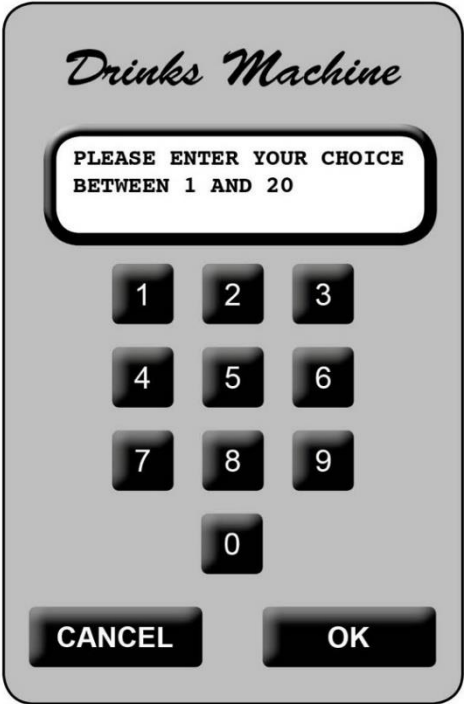Write an **algorithm** and **program** for the process described above.

Algorithm	
Program	
Output	

Challenge 6

Difficulty Level									
1	2	3	4	5	6	7	8	9	10
							✔		

A free drinks machine in an office provides 20 different drinks.

The machine has a small keypad with keys 0 to 9, OK and CANCEL. It also has a small LCD screen, which can display a short message.

To get a drink, users select an item number between 1 and 20 with the keypad and confirm their choice by pressing OK. If they make a mistake, they can press the CANCEL button and start again. If the selection is valid and the drink is available it dispenses the drink. The display screen is used to show suitable short messages throughout the process.

Write an **algorithm** and **program** of the process described above.

Algorithm	
Program	

Truth tables to circuit diagrams

An important area of computer science is understanding the logic gates and diagrams which are used to represent the physical circuitry of computer systems.

Carry out some research into the following areas:

- **Logic gates:**
  - **AND**
  - **NOT**
  - **OR**
- **Truth tables**
- **Boolean expressions**
- **Circuit diagrams**

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: SLR2.4 – Boolean logic
https://student.craigndave.org/videos/slr2-4-boolean-logic
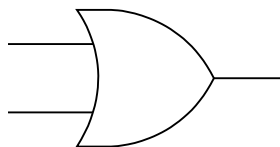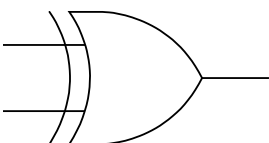
Computational Logic task

Truth tables to circuit diagrams

1. Drag the labels into their correct place on the following diagram:
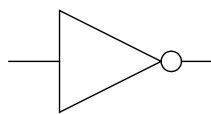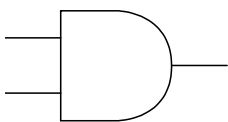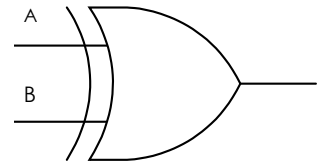

OR

AND

NOT

XOR

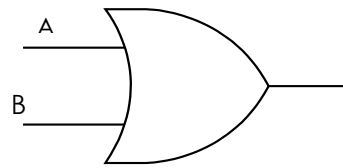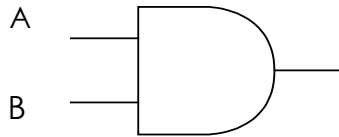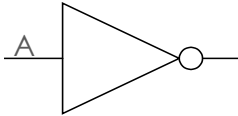# Truth tables to circuit diagrams

2. Complete the truth tables for the following logic gates:

A	
0	
1	

A	B	
0	0	
0	1	
1	0	
1	1	

A	B	
0	0	
0	1	
1	0	
1	1	

A	B	
0	0	
0	1	
1	0	
1	1	

Expected time to complete: 2 hours

Emerging computer technology

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:

- Cyber security
- Autonomous self-drive cars
- Augmented reality
- Computer games
- Computer based implants

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 Ethical, Legal and Environmental impacts of this technology on society
3. What are the possible Ethical, Legal and Environmental risks of this technology on society
4. My conclusion on this technology and what it will mean for our world 10 years from now

Answer here: