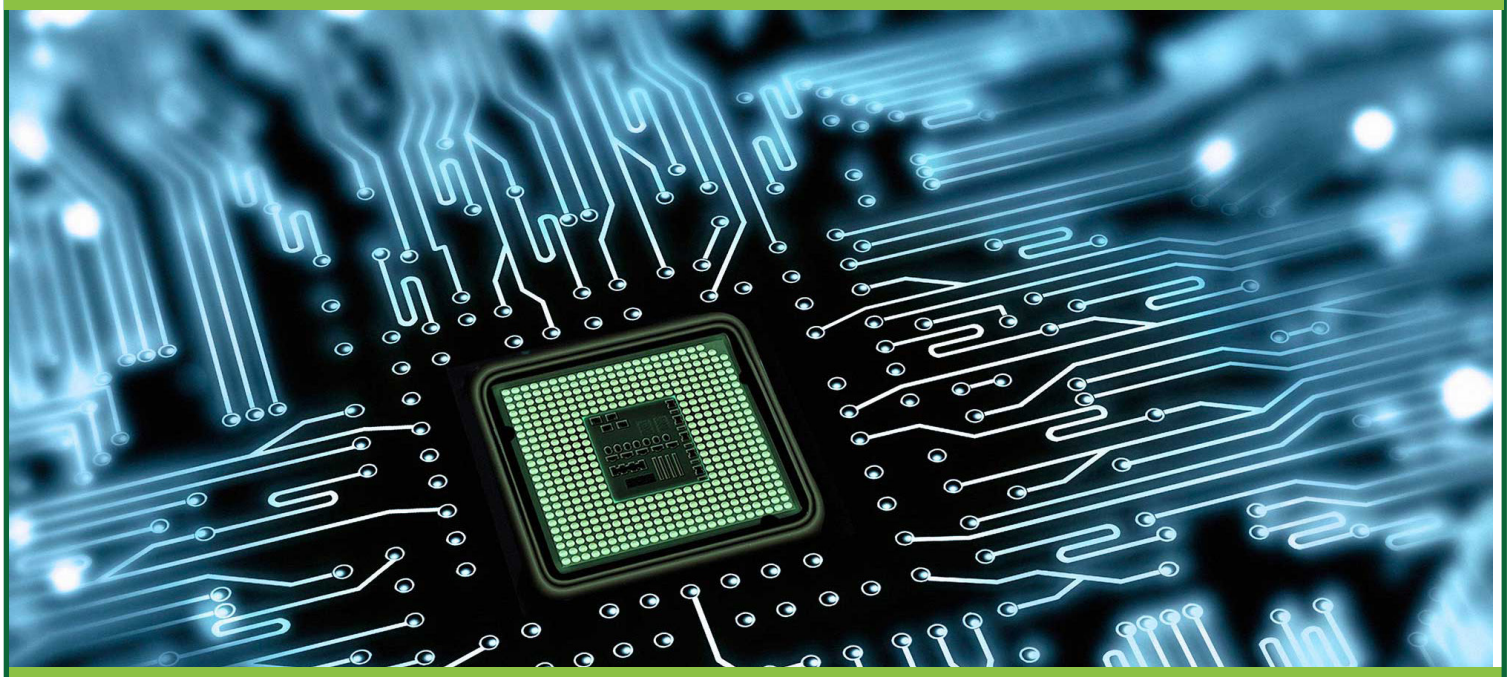
Bentley Wood
High School for Girls

Computer Science Bridging Work

Year 10 into 11 for 2025/26



Name: _____

Tutor Group: _____

Teacher: _____

COMPUTER SCIENCE

Name:

Tutor Group:

Teacher:

Bentley Wood
High School for Girls

GCSE Computer Science

Summer Bridging Work 2025

Year 10 into 11

Aims of the bridging work

The bridging work is organised into three sections, each aimed at solidifying your understanding and honing your skills in Computer Science:

- **Practical Programming Challenges:**

These challenges aim to strengthen your programming skills from year 10 and introduce new concepts. By working on practical exercises, you'll solve real-world problems, use algorithms, and create effective solutions. Regular practise, even in small amounts, is essential for mastering and being creative in programming.

- **Theory – Research-based Task:**

This section focuses on independent research, essential for success in academic and professional settings. You'll explore theoretical aspects of computer science, such as data structures, computational theory, or new technologies. Through thorough research and critical analysis, you'll deepen your understanding and broaden your perspective in the field.

- **Research and Analytical Skills**

Here, the emphasis is on studying in depth a particular topic, to give you the skills that you need to answer the 8 mark questions in the exam.

By engaging with these sections, you will not only strengthen your foundational knowledge but also prepare yourself for the increased technical rigour and independent study demanded as you progress from Key Stage 3 to GCSE. Computer Science lies at the heart of the modern world, and mastering its concepts and skills will make you highly sought after in today’s competitive job market.

Useful Resources

Below is a list of resources to support you during your final GCSE year. These resources are accessible on your Team Page and can be used throughout your summer break.

GCSE Computer Science Specification Tracker:

Paper 1: Computer systems:

Knowledge	☺	😐	☹
1.1 Systems architecture			
1.1.1 Architecture of the CPU			
• The purpose of the CPU			

• Von Newman architecture
  • MAR (Memory Address Register)
  • MDR (Memory Data Register)
  • Program counter
  • Accumulator			

• Common CPU components and their function:
  • ALU (Arithmetic Logic Unit)
  • CU (Control Unit)
  • Cache			

• The function of the CPU as fetch and execute instructions stored in memory			
1.1.2 CPU Performance			

• How common characteristics of CPUs affect their performance:
  • Clock speed
  • Cache size
  • Number of cores			

1.1.3 Embedded Systems			

• Embedded systems
  • Purpose of embedded systems
  • Examples pf embedded systems			

Paper 2: Computational thinking, Algorithms, and programming

Knowledge	☺	😐	☹
2.1 Algorithms			
2.1.1 Computational Thinking			

• Principles of Computational thinking:
  • Abstraction
  • Decomposition
  • Algorithmic thinking			

2.1.2 Designing, creating, and refining algorithms			
• Identify the inputs, processes, and outputs for a problem.			
• Structure diagrams			

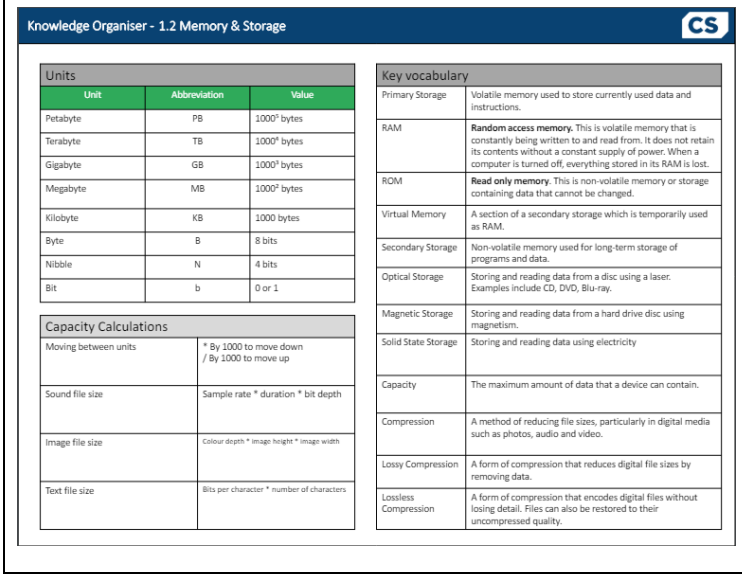
• Create, interpret, correct, complete, and refine algorithms using:
  • Pseudocode
  • Flowcharts
  • Reference language/ high-level programming language			

• Identify common errors.			
• Trace Tables			
2.1.3 Searching and sorting algorithms			

• Standard searching algorithms:
  • Binary search
  • Linear search			

• Standard sorting algorithms:
  • Bubble sort
  • Merge sort
  • Insertion sort			

GCSE Computer Science Knowledge Organiser:



Knowledge Organiser - 1.2 Memory & Storage

CS

Units

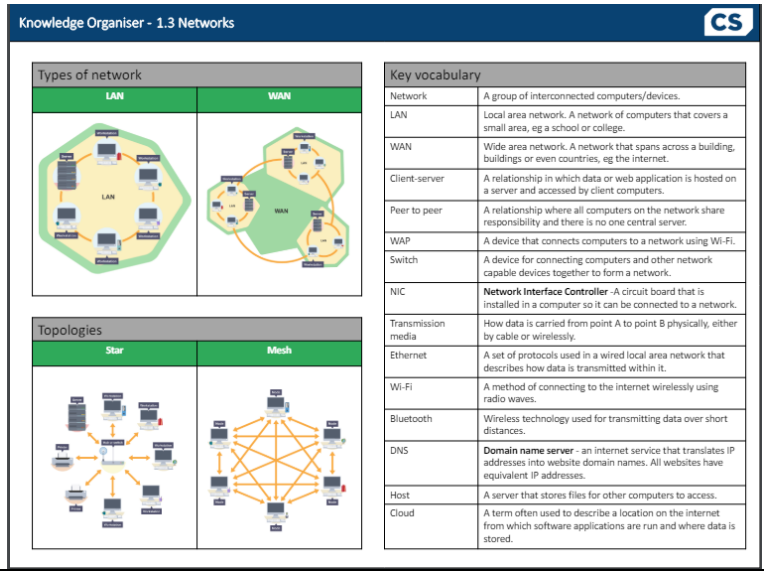
Unit	Abbreviation	Value
Petabyte	PB	1000^5 bytes
Terabyte	TB	1000^4 bytes
Gigabyte	GB	1000^3 bytes
Megabyte	MB	1000^2 bytes
Kilobyte	KB	1000 bytes
Byte	B	8 bits
Nibble	N	4 bits
Bit	b	0 or 1

Capacity Calculations

Moving between units	* By 1000 to move down / By 1000 to move up
Sound file size	Sample rate * duration * bit depth
Image file size	Colour depth * image height * image width
Text file size	Bits per character * number of characters

Key vocabulary

Primary Storage	Volatile memory used to store currently used data and instructions.
RAM	**Random access memory.** This is volatile memory that is constantly being written to and read from. It does not retain its contents without a constant supply of power. When a computer is turned off, everything stored in its RAM is lost.
ROM	**Read only memory.** This is non-volatile memory or storage containing data that cannot be changed.
Virtual Memory	A section of a secondary storage which is temporarily used as RAM.
Secondary Storage	Non-volatile memory used for long-term storage of programs and data.
Optical Storage	Storing and reading data from a disc using a laser. Examples include CD, DVD, Blu-ray.
Magnetic Storage	Storing and reading data from a hard drive disc using magnetism.
Solid State Storage	Storing and reading data using electricity
Capacity	The maximum amount of data that a device can contain.
Compression	A method of reducing file sizes, particularly in digital media such as photos, audio and video.
Lossy Compression	A form of compression that reduces digital file sizes by removing data.
Lossless Compression	A form of compression that encodes digital files without losing detail. Files can also be restored to their uncompressed quality.



Knowledge Organiser - 1.3 Networks

CS

Types of network

LAN

WAN

Topologies

Star

Mesh

Key vocabulary

Network	A group of interconnected computers/devices.
LAN	Local area network. A network of computers that covers a small area, eg a school or college.
WAN	Wide area network. A network that spans across a building, buildings or even countries, eg the internet.
Client-server	A relationship in which data or web application is hosted on a server and accessed by client computers.
Peer to peer	A relationship where all computers on the network share responsibility and there is no one central server.
WAP	A device that connects computers to a network using Wi-Fi.
Switch	A device for connecting computers and other network capable devices together to form a network.
NIC	**Network Interface Controller** -A circuit board that is installed in a computer so it can be connected to a network.
Transmission media	How data is carried from point A to point B physically, either by cable or wirelessly.
Ethernet	A set of protocols used in a wired local area network that describes how data is transmitted within it.
Wi-Fi	A method of connecting to the internet wirelessly using radio waves.
Bluetooth	Wireless technology used for transmitting data over short distances.
DNS	**Domain name server** - an internet service that translates IP addresses into website domain names. All websites have equivalent IP addresses.
Host	A server that stores files for other computers to access.
Cloud	A term often used to describe a location on the internet from which software applications are run and where data is stored.

Online Links:

- CS Newbs Paper 1 & 2 Content
  - *https://www.csnewbs.com/ocr-gcse*

- CS Newbs Python
  - *https://www.csnewbs.com/python*

- Python Beginner's Guide
  - https://wiki.python.org/moin/BeginnersGuide/Programmers

- GCSE Computer Science – Paper 1 Walkthrough
  - *https://www.youtube.com/watch?v=Rkc50S-tj4A&t=52s*

- GCSE Computer Science – Paper 2 Walkthrough
  - *https://www.youtube.com/watch?v=KhUpxmxnF8o*

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

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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 **Flowchart or Pseudocode**	
Program	
Output	

Challenge 2

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 **Flowchart or Pseudocode**	
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 **Flowchart or Pseudocode**	
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 **Flowchart or Pseudocode**	
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.

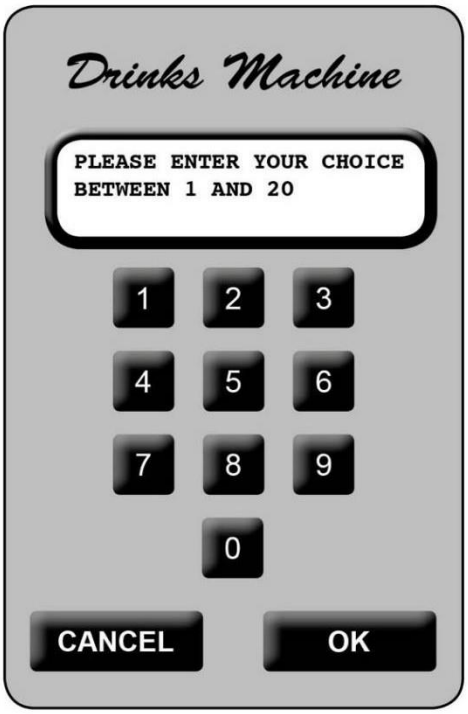
Scores from the quiz should be stored and added to when a student takes a new quiz.

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

Algorithm **Flowchart or Pseudocode**	
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 **Flowchart or Pseudocode**	
Program	

Section 2

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 half a page of research about the following four areas:

1. **Logic gates:**
    - **AND**
    - **NOT**
    - **OR**
    - **XOR**
2. **Truth tables**
3. **Boolean expressions**
4. **Circuit diagrams**

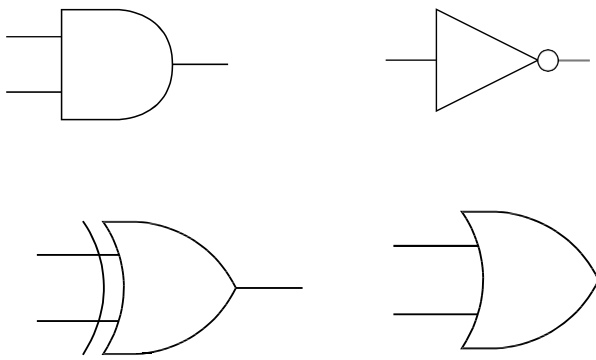
Additional help:

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

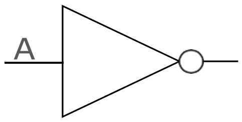
AND

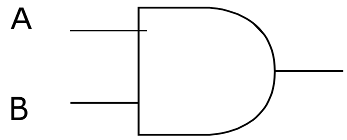
NOT

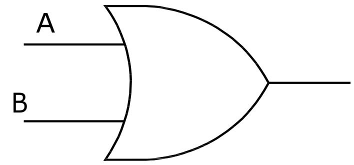
XOR

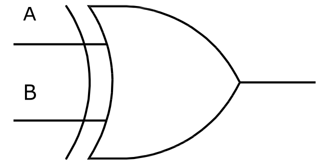
Truth tables to circuit diagrams

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**	

Section 3

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:

Reading for Pleasure

1. 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

2. A Citizen's Guide to Artificial Intelligence
   https://books.google.co.uk/books?id=myAXEAAAQBAJ&newbks=0&hl=en&redir_esc=y

3. Artificial You: AI and the Future of Your Mind
   https://books.google.co.uk/books?id=pDwDEAAAQBAJ&newbks=0&hl=en&redir_esc=y

4. The Alignment Problem: How Can Machines Learn Human Values?
   https://books.google.co.uk/books?id=TdL2DwAAQBAJ&newbks=0&hl=en&redir_esc=y

5. The Atlas of AI
   https://books.google.co.uk/books?id=KfodEAAAQBAJ&newbks=0&hl=en&redir_esc=y

6. 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