HELSBY

Sixth Form

Year 11 Sixth Form Transition Material

Subject Computer Science

AQA

BCE Department

A-Level Computer Science

Year 11 into Year 12 Transition Pack

Welcome Message

The transition from GCSE to a A-level standard is significant. In A-level courses you will see an increasing emphasis on technical content, extended answers and independent research. With Computer Science being a very complex discipline, developing a detailed technical understanding is critical to success. If you have studied GCSE Computer Science this will provide you with an excellent foundation on which to build; nevertheless, it is still important that you consolidate your knowledge and understanding of the GCSE material. If you have not taken the subject at GCSE, do not worry, working through the material below will give you an excellent background on which to start in September. This pack of work is designed to help you through the transition from GCSE to A-level Computer Science and you should find something here to support your preparation regardless of whether you have studied the GCSE course previously or the grade you gained at GCSE. Some of this material is straightforward to complete, while other sections are more challenging. Do remember this is not a standalone "self-study" document. it contains questions and prompts to start you on your journey towards studying these topics in preparation for the A-level course.

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Independent research task

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:

- Artificial intelligence
- Robotics
- Automated self-driving cards
- Quantum computing

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 Social, Moral, Cultural and Ethical **benefits** of this technology on society
3. What are the possible Social, Moral, Cultural and Ethical **risks** of this technology on society
4. My conclusion on this technology and what it will mean for our world 10 years from now

Additional help:

For additional help and support in structuring you answer you might like to watch some of the videos from the following Craig 'n' Dave playlists:

SLR 19: Moral, social, legal cultural issues

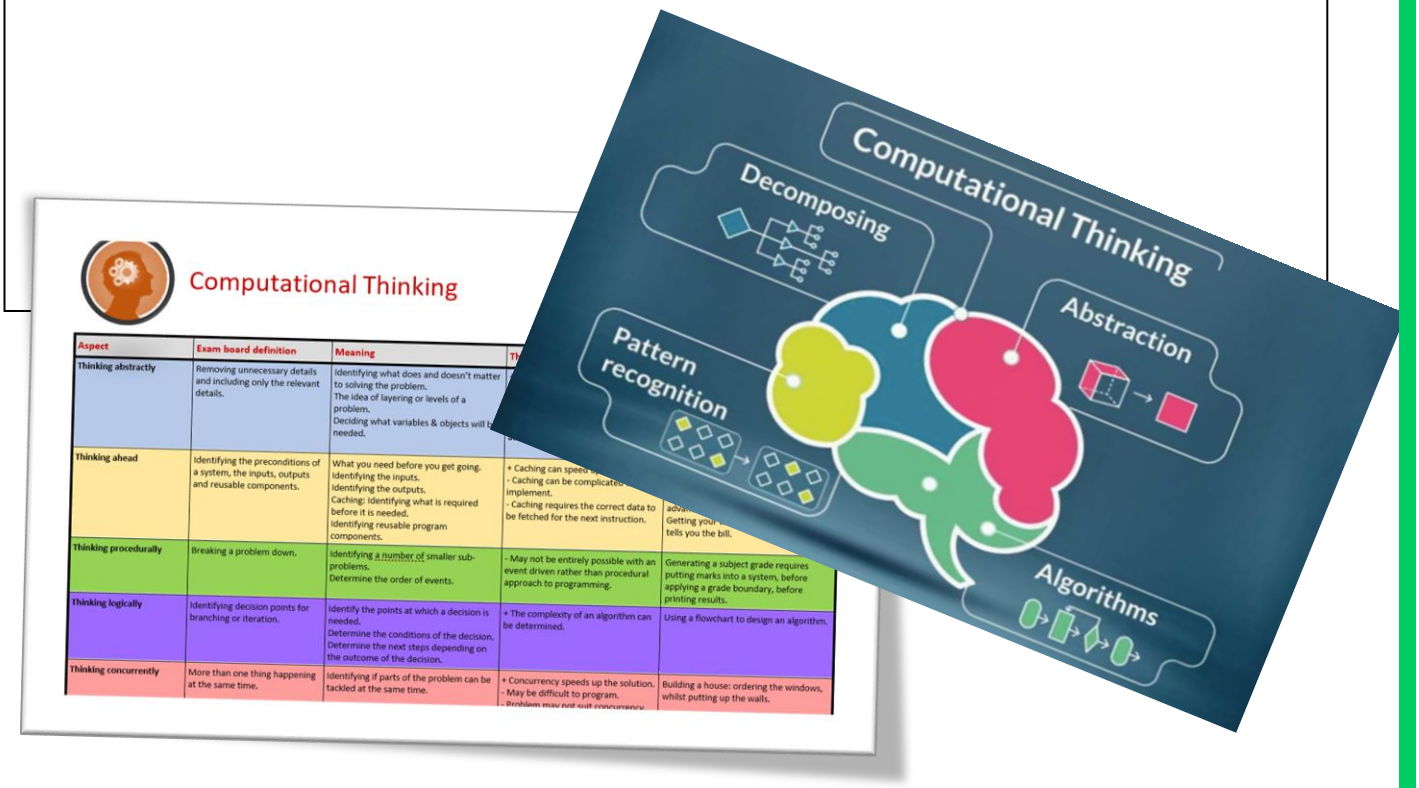
https://student.craigndave.org/videos/slr19-moral-social-legal-cultural-issues

What is "computational thinking"?

Thinking like a computer

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.

1. Download the "Computational thinking and Computational methods placemats" from Craig n Dave:
    - https://student.craigndave.org/specification-key-terminology-and-cheat-sheets
2. 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
3. Your goal is to imagine someone else must revise from your mind map. Ask yourself:
    - Does it make sense?
    - Is it clear?
    - Does it cover all the important concepts?



Key terms task

Getting to grips with terminology

An important aspect of being successful with your study of Computer Science is getting to grips with subject related terminology. There are over 240 specific terms you will need to learn!

Below are a handful of the key terms you will need to become familiar with.

Control Unit **Register** **Busses**

Von Neuman Architecture **Optical Storage** **Operating System**

Intermediate Code **Device Driver** **Compiler**

Assembly Language **Machine Code** **Lossy Compression**

Hashing **Normalisation** **TCP/IP Stack**

Packet Switching **ASCII** **Problem Decomposition**

1. Research each of the key terms and write a definition.
2. Resist the urge to simply cut and paste a definition from the first website you find. Many definitions found on The Internet are overly complicated and wordy.
3. Ask yourself:
    - Does my definition make sense?
    - Is it succinct, to the point?
    - Does the definition have appropriate depth and detail for A-Level?
    - Could I give this definition to another student so they could revise from it?

An introduction to the basics of programming tasks

Programming basics

Learning to "code" is a fun and essential part of A Level Computer Science. This task is ideal if you haven't done the GCSE in Computer Science, or you simply want a nice refresher ahead of starting your A Level course.

1. Head over to the web site: https://www.learnpython.org/
2. Complete the following python tutorials under the heading:
   - Hello, World!
   - Variables and Types
   - Lists
   - Basic Operators
   - String Formatting
   - Basic String Operations
   - Conditions
   - Loops
   - Functions

1. Each section presents you with theory, code to run and exercises to try out.
2. If you want to practice writing your own python programs you can download and install a simple python development tool here: https://www.python.org/downloads/

Critical thinking task

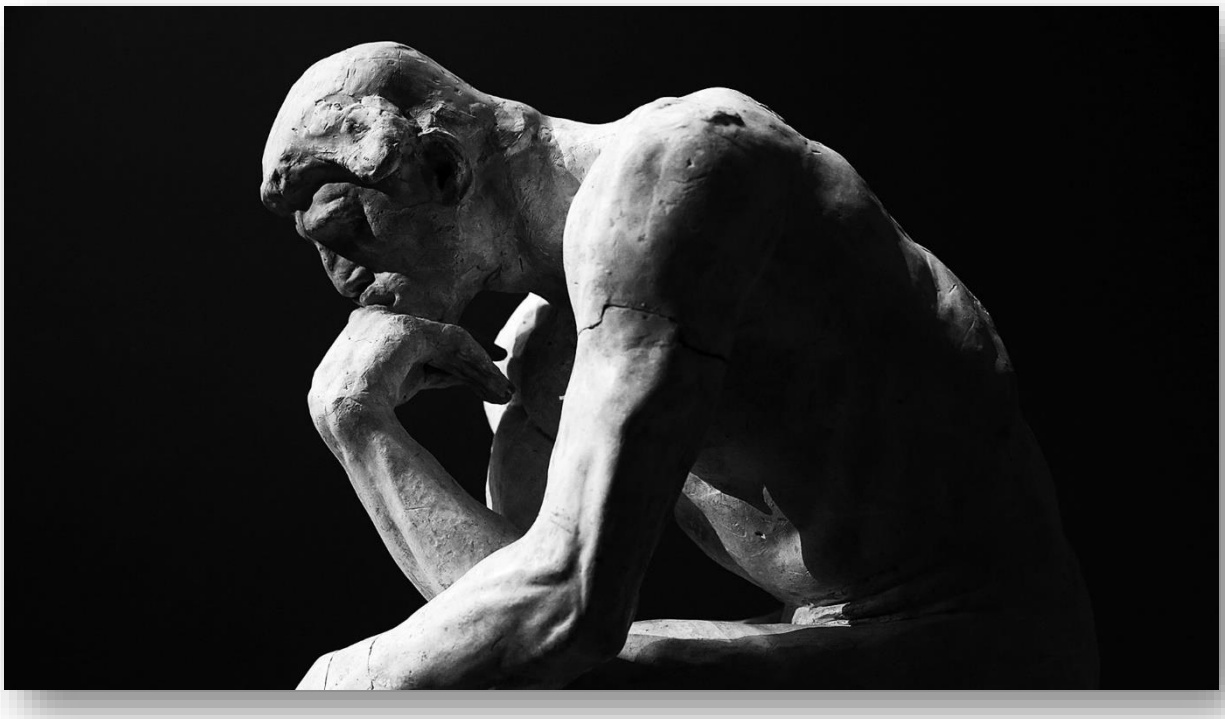
Why is Computer Science important?

It is easy to say, "Computer Science is essential in today's world", but are you able to think critically about this statement and back it up? "Thinking Critically" is an essential skill at A Level.

It involves you:

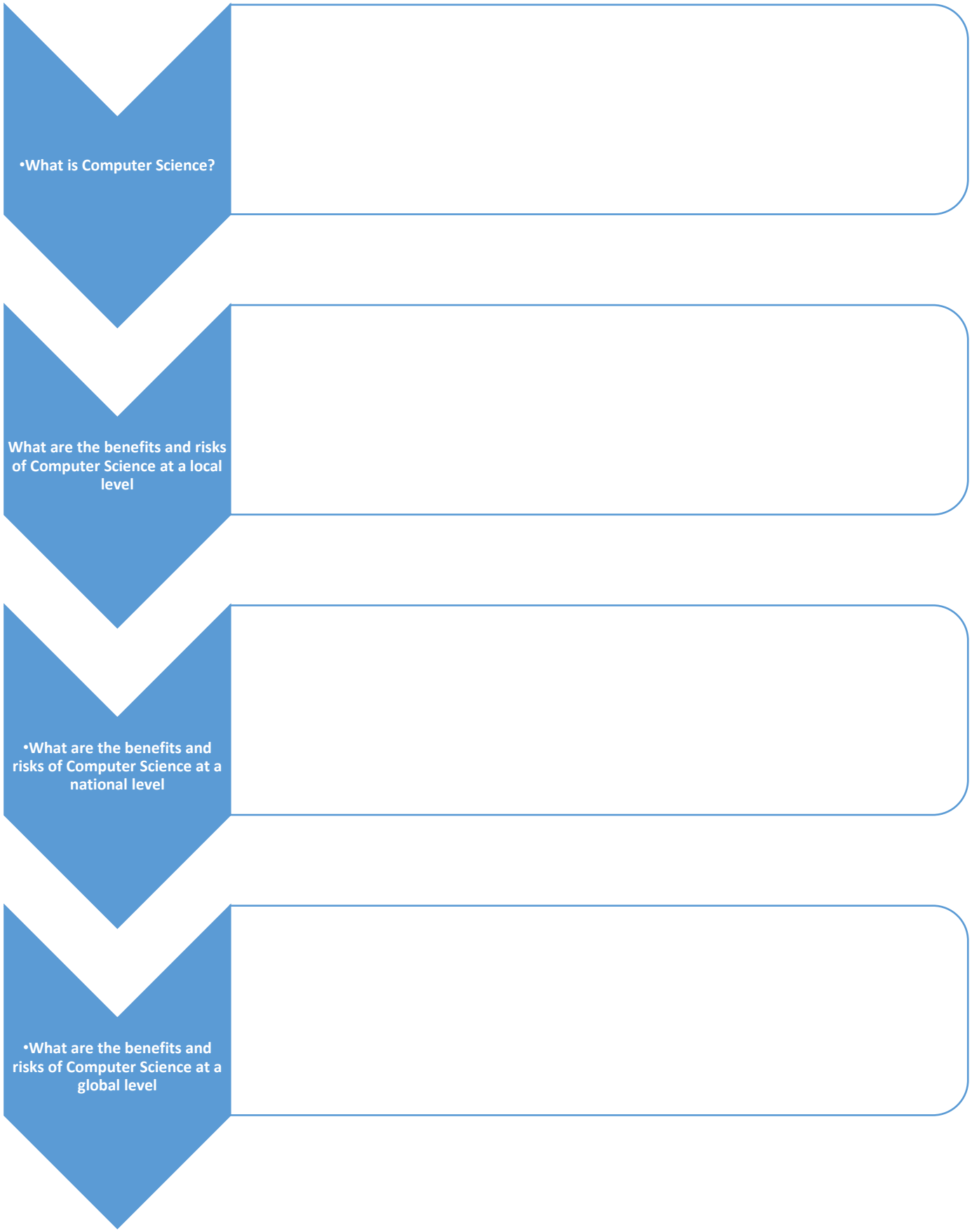
- Looking at a topic / concept in depth
- Taking account of different views / perspectives
- Considering positives and negatives
- Evaluating links and effects on other concepts
- Drawing your own conclusions backed up with evidence

1. On the following page answer the questions:
    - What is Computer Science?
    - What are the benefits and risks of Computer Science at a local level (think about your local community / town / city / county)
    - What are the benefits and risks of Computer Science at a national level
    - What are the benefits and risks of Computer Science at a global level



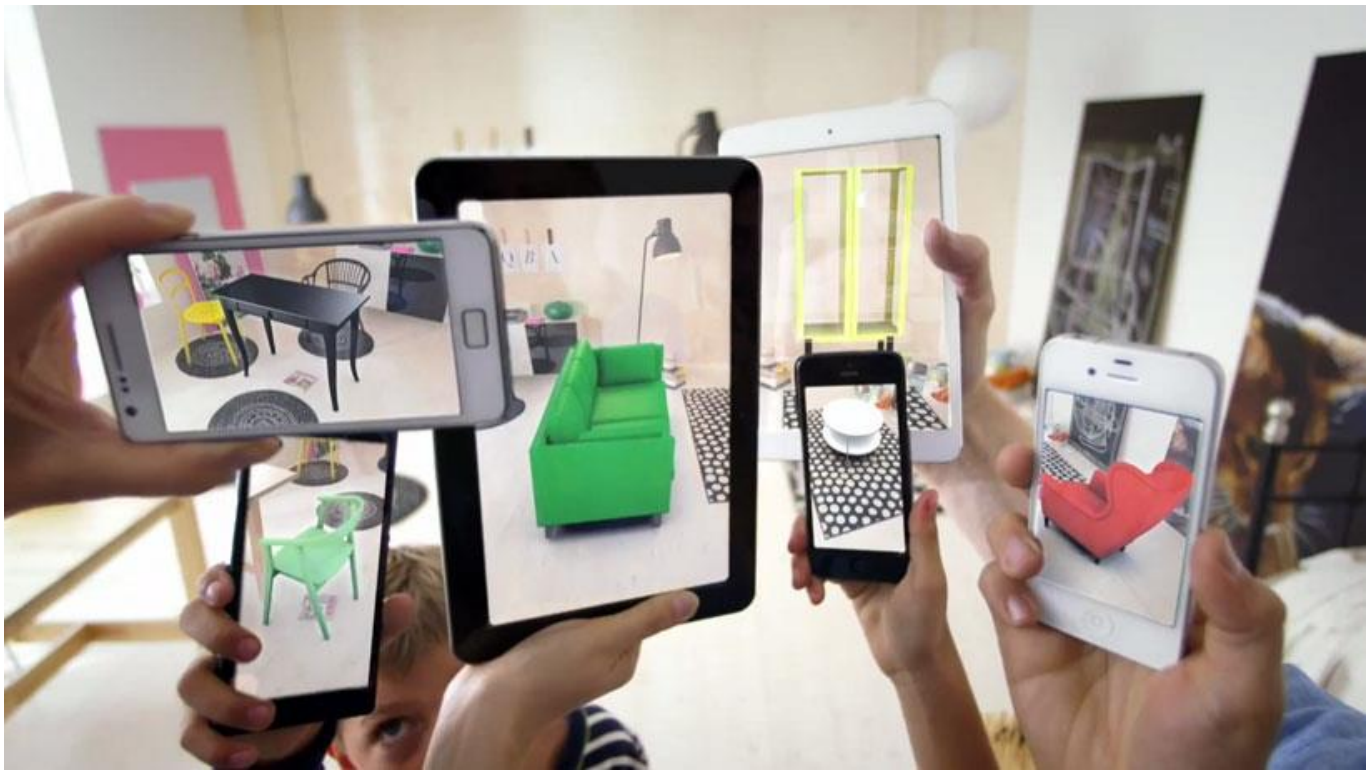
Critical thinking task

Why is Computer Science important?



Applying technical knowledge in context task

Augmented reality



A key skill at A Level is being able to take a topic and then discuss it in the context of different scenarios.

Most theory-based exam questions will be asked in the form of a scenario, simply regurgitating what you know on the topic without contextualising your answer to the scenario will often result in low marks!

The topic for this exercise is "Augmented Reality". It is a truly fascinating area of technology which has the potential to change almost every aspect of our daily lives.

Watch this brief video to learn more: https://www.youtube.com/watch?v=vQtwWzfzKXI

After watching the video complete the next slide which asks you to discuss the benefits, limitations and risks of augmented reality in the context of:

- Medicine & health care
- Gaming & entertainment
- Schools & learning
- Travel & tourism
- Social media
- Transport & navigation

Applying technical knowledge in context task

Augmented reality

•Medicine & health care	Discuss the **benefits**, **limitations** and **risks** of augmented reality in this context:
•Gaming & entertainment	Discuss the **benefits**, **limitations** and **risks** of augmented reality in this context:
•Schools & learning	Discuss the **benefits**, **limitations** and **risks** of augmented reality in this context:
•Travel & tourism	•Discuss the **benefits**, **limitations** and **risks** of augmented reality in this context:
•Social media	•Discuss the **benefits**, **limitations** and **risks** of augmented reality in this context:
•Transport & navigation	•Discuss the **benefits**, **limitations** and **risks** of augmented reality in this context:

Systems architecture task

Looking under the hood of the processor

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.

1. Start by watching the following 3 videos from Craig 'n' Dave (choose from OCR or AQA exam board)
    1. **AQA: https://student.craigndave.org/videos/aqa-alevel-slr17-the-processor-and-its-major-components**
    2. **AQA: https://student.craigndave.org/videos/aqa-alevel-slr17-alu-cu-registers-and-buses**
    3. **AQA: https://student.craigndave.org/videos/aqa-alevel-slr17-performance-of-the-cpu**

2. Produce a fully annotated diagram on a single sheet of A4 / A3 paper which shows how the CPU works.
3. Make sure the diagram includes and covers:
    1. Major CPU components and what they are for:
        - Arithmetic Logic Unit (ALU)
        - Control Unit (CU)
        - Cache
    2. The main registers
        - Program Counter (PC)
        - Memory Address Register (MAR)
        - Current Instruction Register (CIR)
        - Memory Data/Buffer Register (MDR / MBR)
    3. Fetch-decode-execute cycle
    4. 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

Systems software task

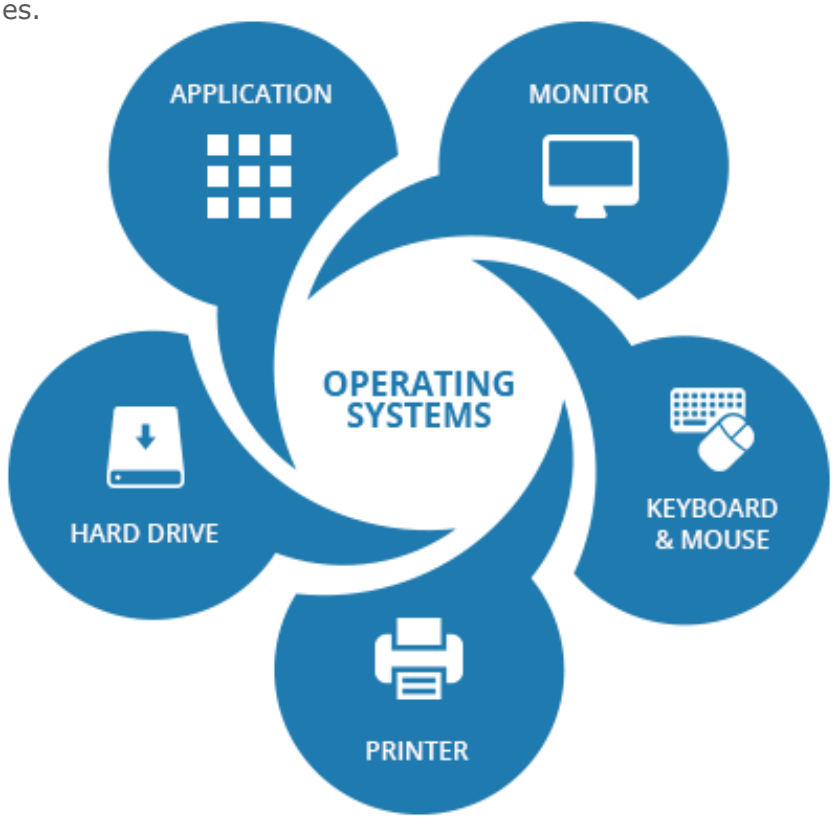
Operating systems

Operating systems are arguably the most important piece of software installed on a computer.

Carry out some research into the following areas:

- The purpose of operating systems
- The roles of operating systems
- The purpose of interrupts
- How interrupts work as part of the fetch-decode-execute cycle

Complete the tasks on the following pages.



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:

AQA: SLR14 – Hardware & software

https://student.craigndave.org/videos/slr14-hardware-software

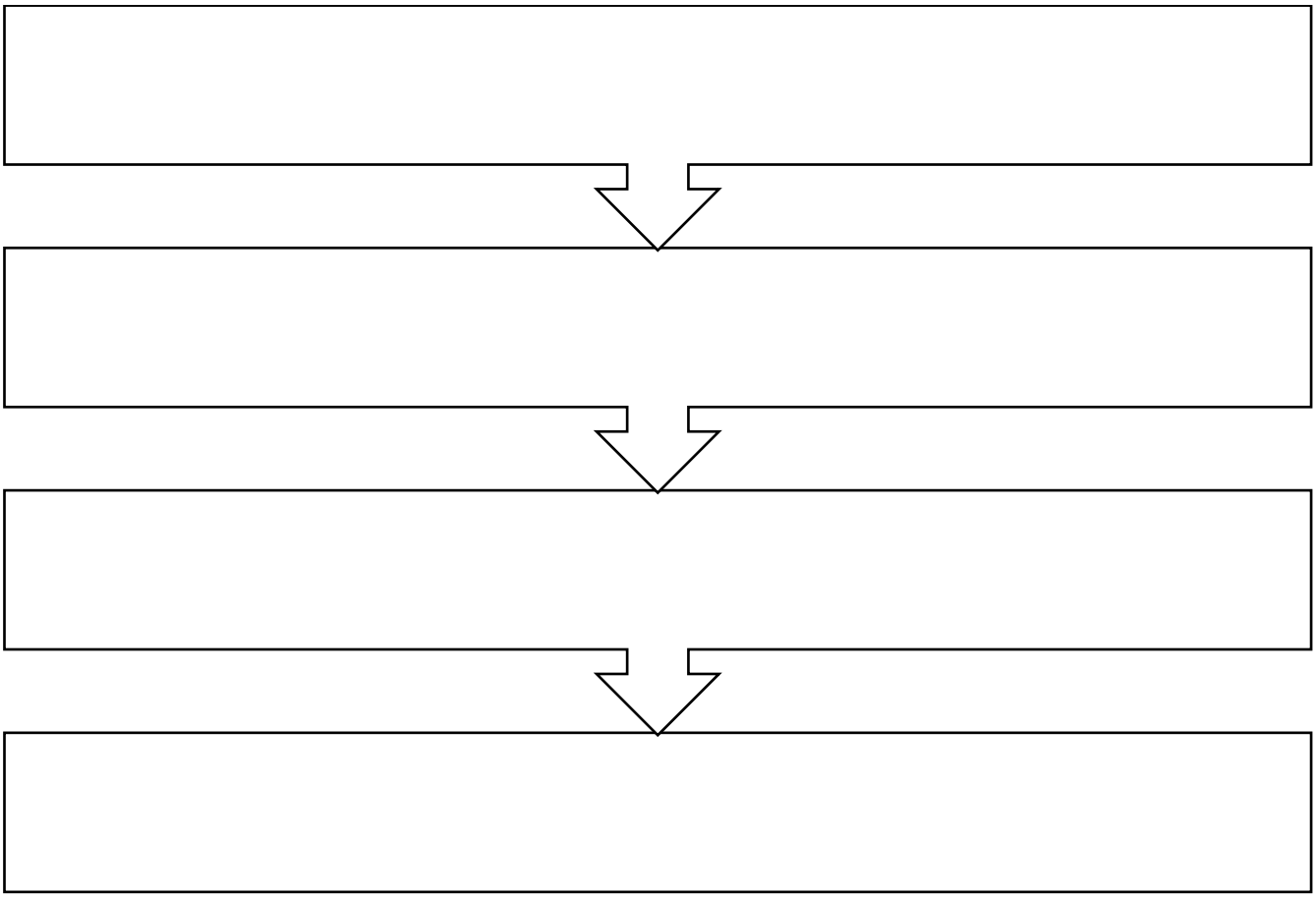
1. List at least 8 different roles an Operating System perform.

The purpose and roles of an Operating System

Systems software task

Operating systems

2. Write the labels into the correct place on the following diagram:



Hardware

User

Operating System

Applications

4. Explain what this diagram is showing: