

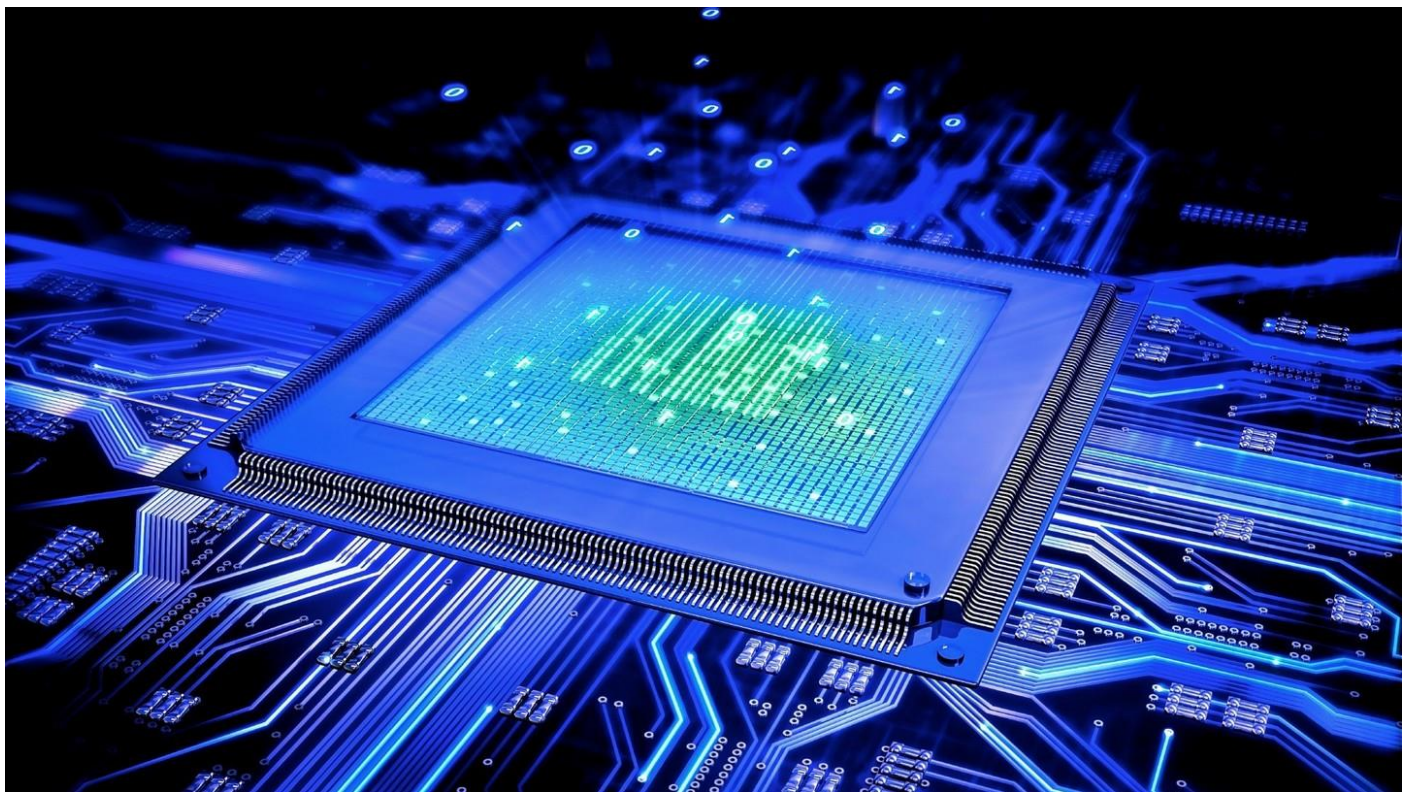
Computer Systems

Activity Workbook

Name: _____

Class: _____

Teacher: _____



L1 - Spot the embedded systems

Use this sheet to complete the activities on embedded systems, and to revise from later.

Task 1 Define general purpose vs embedded systems

Type	Definition
	Computers with a variety of uses, the tasks are usually chosen by the end user.
	Specialised systems that do a limited set of tasks very well, functions usually chosen by the manufacturer.

Task 1 Spot the embedded systems



General purpose	Embedded systems
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Task 3 Characteristics

General purpose systems...

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-
-

Embedded systems...

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-
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L1 - The start-up sequence

To start this unit on computer systems, you are going to explore what happens inside your computer when you hit the power button.

Task 1 The hardware and software

Match the definition to the component

The CPU	Contains all the basic code for controlling your computer hardware (such as keyboards, mice, monitors, and hard drives).
RAM	Read-only memory
ROM	A large chip inside the computer. The brains of the computer: it controls everything.
Hard drive	Random access memory
BIOS	The main storage device in your computer.

Task 2 The start-up sequence

1	The boot sequence begins
	Operating system is fetched from secondary storage
	Instructions from BIOS are loaded into RAM
	BIOS starts up the monitor and keyboard
	Operating system is loaded into RAM
	BIOS checks the computer is working
	CPU starts up and fetches the BIOS from ROM
8	The BIOS hands control over to the operating system

L1 - The role of an operating system

To start this unit on computer systems, you are going to explore what happens inside your computer when you hit the power button.

Task 1 Operating systems

What is an operating system?

Give two examples of operating systems and the devices they run on (for example: desktop, laptop, or mobile phone).

Operating system	Devices

Task 2 The role of an operating system

Match the definition to the component as it is discussed on the board.

Error handling	The operating system controls where each piece of data is stored in RAM.
Program management	Instructions are executed by the CPU, but the operating system controls which instructions are fed in to be executed.
Memory management	The operating system captures data from peripherals and provides data to the output devices to display to the user.
Interaction with the user	When you save data to your hard drive, the operating system will find an available section of storage and send the data to be written to that location.
Processor management	The operating system stops unauthorised individuals from accessing data on secondary storage or the data in memory.
Input and output	When a program fails or encounters a problem, the operating system protects the wider system from crashing.
Security	Often our computers are running multiple processes at once. The operating system makes sure that each application has enough resources to accomplish its tasks.
File management	The operating system provides a graphical user interface which makes operating the computer much simpler.

L2 - Utility software

You have already heard about one type of system software — operating systems. Now you are going to do a bit of research on the other type — utility software — to share with your classmates.

You will only have to research one of these, your classmates will research the rest.

Utility software	Description	Examples
Compression software		
Encryption software		
Email application		
Defragmentation software		
Antivirus software		
Backup tools		

L2 - The parts of the CPU

Use this sheet to draw an image to remind you of each component in the CPU and what they do.

ALU		Description
The control unit		Description

Clock		Description
Registers		Description
Buses		Description

L3 – The FDE cycle

Task 1 Check the components

MAR: Memory address register

MDR: Memory data register

CIR: Current instruction register

Component	Fetch	Decode	Execute
Control unit			
ALU			
Buses			
MAR			
MDR			
CIR			
Program counter			
Accumulator			

L4 - Retrieval practise: the CPU

To start the lesson, answer the following multiple choice questions.

Question 1

What are registers?

- a. A location to store attendance
- b. A small, fast access memory location
- c. A location to store status quickly

Answer:

Question 2

What is a clock?

- a. A clock records the number of cycles
- b. A clock times how long a processor has been running
- c. A clock synchronises the cycles per second

Answer:

Question 3

What does ALU stand for?

- a. Arithmetic logic unit
- b. Arithmetic link unit
- c. Algorithm logic unit

Answer:

Question 4

What is a bus?

- a. A single wire that transfers data
- b. A set of wires that transfer data

- c. A set of wires that transmit data

Answer:

Question 5

What is a control unit?

- a. A unit that regulates the speed of the system
- b. A unit that executes instructions
- c. A unit that tells the other components how to respond to instructions

Answer:

Question 6

What is the role of the ALU?

- a. The ALU carries out logical and mathematical operations
- b. The ALU helps to save to memory
- c. The ALU controls the bus system

Answer:

L4 - Main memory knowledge organiser

RAM	Both	ROM
R____ A____ M____		R__ O__ M____

L5 - Storage vs memory

Use the table below to mark the characteristics of the components listed.

Component	Volatile (✓)	Portable (✓)	Durable(✓)	Read/Write	Cost	Speed	Capacity
RAM							
ROM							
Hard drive							
CD							
USB stick							

L5 - Knowledge organiser — secondary storage

Use the table below to capture the characteristics of the types of secondary storage.

Type	Solid state	Optical	Magnetic
Data is written...			
Data is read...			
1s and 0s			
Advantages			
Disadvantages			
Examples			

L8 - Selecting storage devices

Using your knowledge of storage devices you need to be able to recommend an appropriate device. You should also provide reasons for your choice.

Scenario 1 - Jamie

“Jamie wants to send his mum a copy of his wedding photos through the mail. There are a lot of photos, totalling 2GB of data.”

- a. Highlight the key parts of this description, as the teacher explains it.
- b. Which categories are important to Jamie? Copy this - ✓ - to mark the correct options.

Capacity	Cost per GB	Speed	Durability	Reliability	Portability

- c. Use your knowledge organiser from last week to decide which type(s) of storage would work. Use this - ✓ - to mark all the types that might work.

Solid state	Optical	Magnetic

- d. What devices would you recommend? Add a reason for your choice next to the device.

Device	Reason

Scenario 2 - Maja

“Maja has made a video game and wants to distribute it to her paying customers.”

- a. Highlight the key parts of this description, as the teacher explains it.
- b. Which categories are important to Maja? Copy this - ✓ - to mark the correct options.

Capacity	Cost per GB	Speed	Durability	Reliability	Portability

- c. Use your knowledge organiser from last week to decide which type(s) of storage would work. Use this - ✓ - to mark all the types that might work.

Solid state	Optical	Magnetic

- d. What devices would you recommend? Add a reason for your choice next to the device.

Device	Reason

Scenario 3 - Ana

“Ana needs to back-up her video archives, she is a freelance videographer and has a large collection of videos to save.”

- a. Highlight the key parts of this description, as the teacher explains it.
- b. Which categories are important to Ana? Copy this - ✓ - to mark the correct options.

Capacity	Cost per GB	Speed	Durability	Reliability	Portability

- c. Use your knowledge organiser from last week to decide which type(s) of storage would work. Use this - ✓ - to mark all the types that might work.

Solid state	Optical	Magnetic

- d. What devices would you recommend? Add a reason for your choice next to the device.

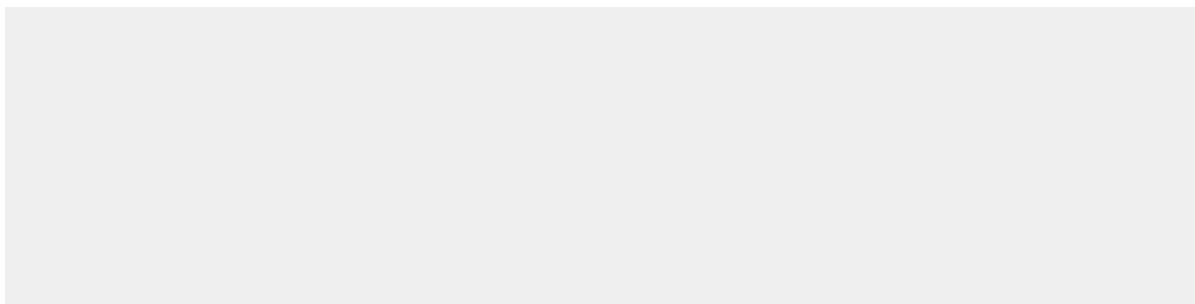
Device	Reason

L7 - Cloud storage

There is another type of storage you need to know about, a more modern solution known as cloud storage. This sheet will help you take notes about this type to revise later.

Cloud storage	
Description	
Data is stored....	
Advantages	
Disadvantages	

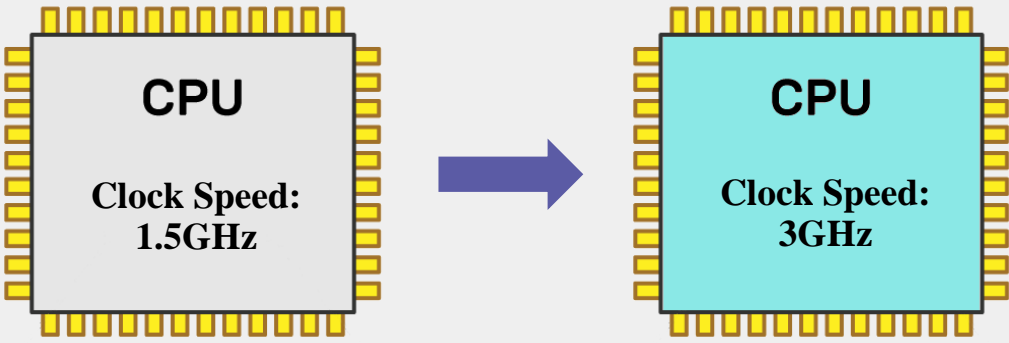
1. Explain the increase in use of cloud storage in the past 10 years.

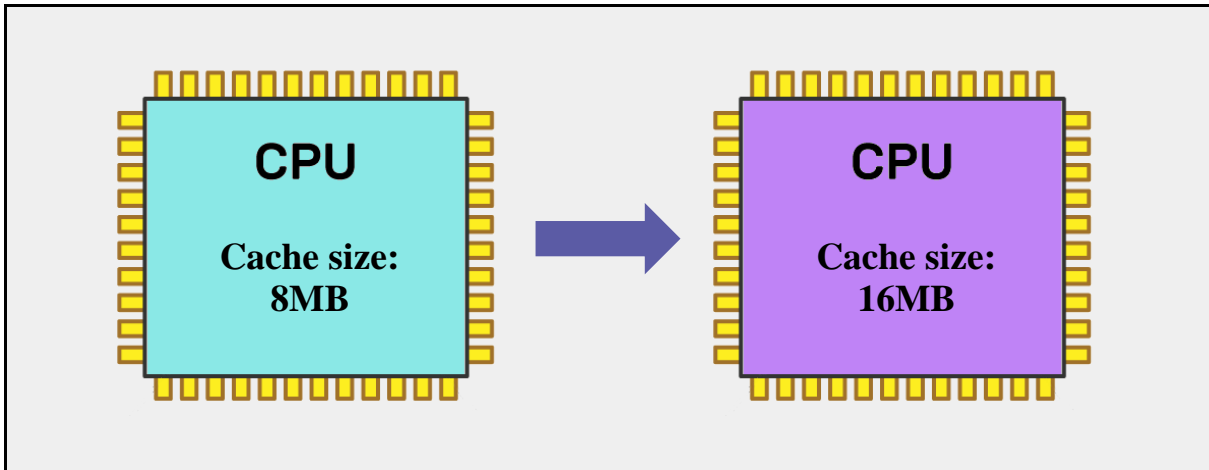


L8 - My CPU won't do: Factors affecting CPU performance

The processor inside of a computer executes the instructions that make up our programs. There are certain factors that will impact how quickly the processor can do this. Your teacher needs your help to identify the changes in processing power if they upgrade their CPU.

For each pair of processors, you should answer the questions about the changes your teacher will see if they upgrade to that processor.

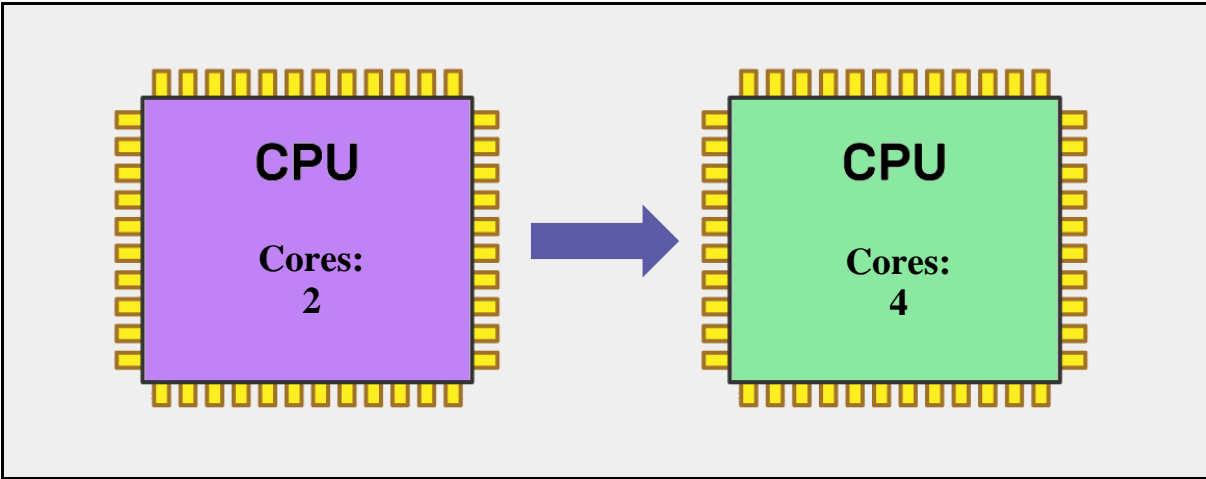

Describe the difference between these two processors.
Explain what impact this will have on the execution of a program.



Describe the difference between these two processors.

Explain what impact this will have on the execution of a program.

Why will it impact the execution in this way?



Describe the difference between these two processors.

"I think that doubling the amount of cores in my processor will make it twice as fast."

I disagree because...

L8 - Selecting components

You are going to play the role of a custom PC builder, you run a shop to create computers for customers.

For this task, you will use <https://pcpartpicker.com/list/> to pick your components.

There are lots of components to choose on the site, but you are only going to select some of them for this task.

Your first computer

You have been given a budget of \$400 to create the best computer possible. Use the table below to capture the components you have chosen.

Component	Name	Specification	Price (\$)
CPU			
Motherboard			
Memory			
Storage			
Operating system			

A new customer

You have a new customer who wants a more expensive computer.

You now have \$1000, but your computer must have:

- As much RAM as possible
- A video card

Component	Name	Specification	Price (\$)
CPU			
Motherboard			
Memory			
Storage			
Video card			
Operating system			