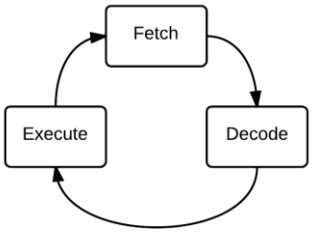
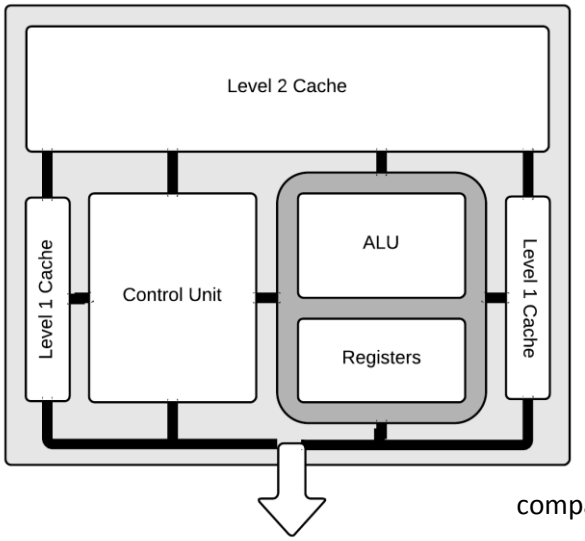
The CPU - Reading



The **CPU** (**Central Processing Unit**) is responsible for the processing of data in the computer. Most computers today use a **Von Neumann architecture**.

The CPU **fetches the next instruction** to be processed from **main memory** (RAM) to the CPU, **decodes the instruction** and then **executes the instruction**. This is known as the **fetch-execute cycle**.



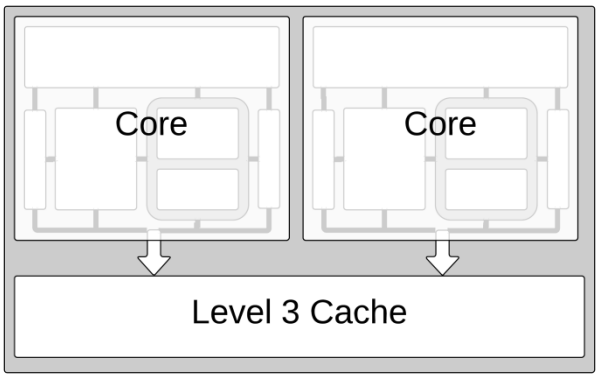
A **bus** is a **circuit** (wires) on the motherboard which connects components such as RAM and CPU together. Data is moved around the system through the bus.

The CPU contains a **control unit** which coordinates the timing of the units and the flow of data in the CPU. It is responsible for fetching and decoding instructions and also managing their execution on the processor.

A CPU contains a very small amount of storage called **registers**. In a 64 bit processor, each register will store just 64 bits. **The Arithmetic Logic Unit** (**ALU**) is responsible for **arithmetic operations** like addition and subtraction. It is also responsible for **logical operations** such as the comparison of two numbers.

Cache is very similar to **RAM** (**Random Access Memory**). It is faster and more expensive to produce. A small amount of **level 1 cache** is placed next to the control unit for instructions and next to the ALU and registers for data. As the level 1 cache only stores a very small amount of data, if the CPU needs some data that isn't in level 1 cache then it will try the **level 2 cache**. This process continues through **level 3 cache** and finally to RAM. A computer may have 6 GB of RAM but only 6MB of level 3 cache.

A **dual core processor** has two **cores**. Each core can process data in **parallel** (at the same time). The cores normally have a shared area of **level 3 cache**. Processors can have four cores (**quad core** processors) or more. Processors that have more than one core are known as **multi-core** processors.



CPUs have a **clock speed**. This is the number of **fetch-execute cycles** that they can carry out per second. All processing for an instruction at different parts in a processor must be complete when the clock **ticks**. The clock speed is usually measured in **megahertz** (**MHz**) or **gigahertz** (**GHz**). A typical CPU today will have a speed around 3 GHz – 3 billion cycles per second.

Question: A quad core processor has a clock speed of 2.8 GHz. How many operations will it carry out per second?

Answer: 2.8 billion * 4 = **11.2 billion operations per second.**

Name: _____

The CPU - Questions

Q 59

1. What type of computer architecture do most computers use today?

_____ [1]

2. The main processing component in a computer is known as what?

_____ [1]

3. In the fetch-execute cycle, an instruction is fetched then executed. What happens between these two steps?

_____ [1]

4. Match the parts of a CPU on the left to what they do on the right.

ALU	Very small amounts of memory
Control Unit	Timing of the parts of the CPU
Registers	Arithmetic and logical operations

[3]

5. Match the units on the left to their meanings on the right

MHz	Thousand per second
kHz	Million per second
GHz	Billion per second

[3]

6. A processor states that it is dual core. How many cores does it have?

_____ cores [1]

___
10

7. For each description below, what part of the CPU do they describe?

Description	CPU part
A type of memory on the processor that stores only a few bytes of data for each one	
Responsible for arithmetic and logical operations	
Needed to coordinate timing and data flow in the processor	
An intermediate type of memory between registers and RAM	

[4]

8. A dual core processor has a clock speed of 1.7 GHz. How many operations will it carry out per second?

_____ operations per second [1]

9. Fill in the text below with the words beneath.

A CPU will make use of very small areas of memory called _____ which operate at the same speed as the processor. The CPU can also read from, and write to, RAM. This operates at a _____ speed. It takes time for the CPU to process an instruction. Each instruction must be completed before the next _____. All instructions and data will be sent through _____ to get from one component on the motherboard to another. [4]

slower **registers** **busses** **clock tick**

10. A CPU that contains more than one core is known as what type of processor?

multi-core processor [1]

___
10

1. What type of computer architecture do most computers use today?

Von Neumann architecture [1]

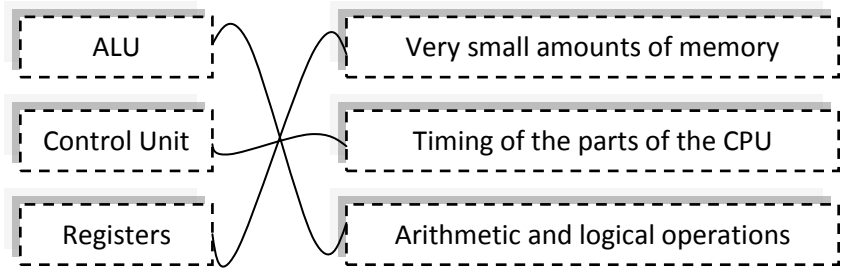
2. The main processing component in a computer is known as what?

CPU / Central Processing Unit [1]

3. In the fetch-execute cycle, an instruction is fetched then executed. What happens between these two steps?

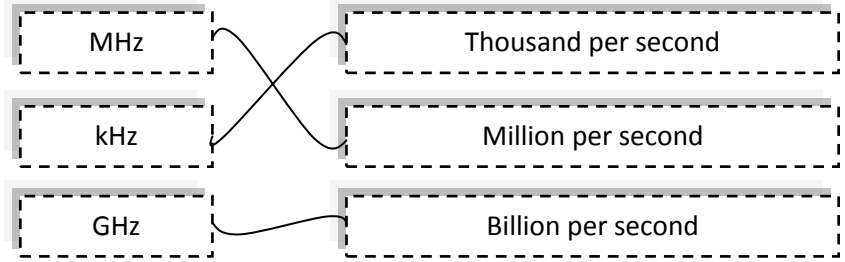
Decode [1]

4. Match the parts of a CPU on the left to what they do on the right.



[3]

5. Match the units on the left to their meanings on the right



[3]

6. A processor states that it is dual core. How many cores does it have?

2 cores [1]

___
10

7. For each description below, what part of the CPU do they describe?

Description	CPU part
A type of memory on the processor that stores only a few bytes of data for each one	**Registers**
Responsible for arithmetic and logical operations	**ALU**
Needed to coordinate timing and data flow in the processor	**Control unit**
An intermediate type of memory between registers and RAM	**Cache**

[4]

8. A dual core processor has a clock speed of 1.7 GHz. How many operations will it carry out per second?

1.7 * 2 = **3.4** operations per second [1]

9. Fill in the text below with the words beneath.

A CPU will make use of very small areas of memory called **registers** which operate at the same speed as the processor. The CPU can also read from, and write to, RAM. This operates at a **slower** speed. It takes time for the CPU to process an instruction. Each instruction must be completed before the next **clock tick**. All instructions and data will be sent through **busses** to get from one component on the motherboard to another. [4]

slower **registers** **busses** **clock tick**

10. A CPU that contains more than one core is known as what type of processor?

multi-core processor [1]

___
10