# Worksheet 3 Types of processor

**Task 1**

1. Using standard von Neumann architecture, instructions and data both share the same memory space.

|  |  |
| --- | --- |
| **Memory** | |
| **Address** | **Instruction / Data** |
| 0 | 10010111 00101111 |
| 1 |  |
| 2 | 00000000 11010100 |
| … | … |
| 255 | 00000000 01001010 |

One problem with this model is that the CPU can either be reading an instruction or reading/writing data to or from memory, but not both at the same time since instructions and data use the same bus system, which is a performance limitation.

(a) Name another architecture that resolves this issue. How does it differ from von Neumann architecture?

Harvard architecture, where data and instructions are kept separate in memory

(b) What other advantages are there of using this architecture?

Guranteed that you always process instructions.

You can have different word lengths for data and instructions.

Can be faster for CPU because if you need to fetchboth data and instructions, they wont be competing for the same bus, they can be parallel processed.

# (c) What are the advantages of von Neumann architecture over Harvard architecture?

You can partition the memory in anyway you want, it is flexible

2. Complete the following text by using the words an phrases given below to fill in the gaps.

CISC stands for Complex Instruction Set Computer. In this technology, the instruction set consists of a large number of instructions, each designed to execute a series of sub-tasks that make up a single instruction. Because the code is relatively short, very little RAM is needed to store the instructions.

RISC stands for Reduced Instruction Set Computer. This type of computer uses a small instruction set, and each instruction can be performed in one clock cycle. This means that pipelining is possible, and performance is at least as good or better than CISC.

Cheap RAM has contributed to the prevalence of this technology in almost all modern desktop computers.

pipelining short large clock cycle performance very little sub-tasks instruction instruction set Complex Instruction Set Computer small RAM RISC

**Task 2**

Compare co-processor and parallel processor systems. (Note that “compare” means describe similarities and differences.)

A co processor is an extra processor that doesn’t directly contribute to improving the performance of the main processor, but instead, it helps indirectly by having extra features and functions, meaning it cant fetch instructions for example, but it is able to do things like floating point arithmetic, graphics processing, etc. Extra functions that help make it easier for the general purpose processor to work.

Parallel processor systems on the other hand distribute workload among processors so that processing can be as efficient as possible. Basically, the multiple processors are to directly improve performance.

In both cases, more processors are added to the system, however a co-processor doesn’t aid directly to the performance of the general purpose processor, instead giving it more options and functions so that for example, it doesn’t have to run multiple different instructions to perform a floating point arithmetic function, instead it can straight up do it.

Parallel processors instead improve performance and allow overall faster and greater efficiency in processing, so for example, a floating point arithmetic operation can be carried out quicker even though it might require multiple instructions to perform.