| Performance =  To compare the performance of two CPUs, we compare with 1. |
| --- |

**Problem 1.**

If computer A runs a program in 10 seconds and computer B runs the same program in 17 seconds, which computer is more performant and by how much?

| CPUtime= CPUexecution time = timpul necesar ca CPU-ul să completeze un anumit task  CPUtime= user CPUtime  + system CPUtime  user CPUtime  = timpul necesar rulării propriu-zise a programului  system CPUtime = timpul necesar pregătirii sistemului de operare pentru rularea programului |
| --- |

| CPUtime = CPUclock cycles x Clock cycle time  [s] = (fără unitate de măsură) [s] |
| --- |

| CPUclock cycle time =  [s] = | CPUclock cycle rate =  [Hz] = |
| --- | --- |

**Problem 2.**

Our favourite program runs on computer A, which has a 2 GHz clock in 10 seconds. We want to help a compiler designer build computer B, which will run the same program in only 6 seconds. The designer has determined that a substantial increase in the clock cycle rate is possible, but it will affect the rest of the CPU design, causing computer B to require 1.2 as many clock cycles as computer A for this program. What clock cycle rate should we tell the designer to target for computer B?

| CPUclock cycles = Instruction Count (IC)x *average CPI*  [no. of clocks] [no. of instr.] [no. of clocks/instr.] |
| --- |

**Problem 3.**

Suppose we have two implementations of the same instruction set architecture. Computer A has a clock cycle time of 250 ps and a CPI of 2, while computer B has a clock cycle time of 500 ps and a CPI of 1.2 for the same program.

Which computer is faster and by how much?

| CPUtime = Instruction Count (IC) x *average CPI* x clock cycle time |
| --- |

**Problem 4.**

A given application written in Java runs **17 seconds** on a desktop processor. A new Java compiler is released and it requires only **0.6 as many instructions** as the old compiler. Unfortunately, it increases the CPI **by 1.3**.

How fast can we expect the application to run using this new compiler?

**Problem 5.**

|  | **Clk rate** | **CPI class A** | **CPI class B** | **CPI class C** | **CPI class D** |
| --- | --- | --- | --- | --- | --- |
| **Processor 1** | 2.5 GHz | 1 | 2 | 3 | 3 |
| **Processor 2** | 3 GHz | 2 | 2 | 2 | 2 |

We are comparing 2 different machines running the same program. The sequence has 106 instructions, divided like this:

|  | **IC A** | **IC B** | **IC C** | **IC D** |
| --- | --- | --- | --- | --- |
| **Percentage** | 10% | 20% | 50% | x% |

1. Which implementation is faster?
2. What is the average CPI for each implementation?

**Problem 6.**

|  | IC depending on code sequence and operation type | | | |
| --- | --- | --- | --- | --- |
| **ALU ops.** | **Store** | **Load** | **Branches** |
| **Code sequence 1** | 650 | 100 | 600 | 50 |
| **Code sequence 2** | 570 | 250 | 500 | 500 |

|  | **ALU ops.** | **Store** | **Load** | **Branches** |
| --- | --- | --- | --- | --- |
| **CPI** | 1 cc | 5 cc | 5 cc | 2 cc |

Clock cycle rate = 2.1 GHz

1. CPU exec time = ? for both sequences
2. average CPI for each sequence