Measuring performance

1. Fundamental formula for execution time

$$\text{execution time} = \frac{\text{total clock cycles}}{\text{clock rate}}$$

Since the clock rate and clock period are reciprocals of each other, we can rewrite the right side as: (total clock cycles) * (clock period)

2. Clock Cycles per Instruction (CPI)

$$\text{CPI} = \frac{\text{total clock cycles}}{\text{total \# instructions}}$$

This formula is often used to determine the total number of clock cycles of a program (cross-multiply): clock cycles = (# instructions) * CPI

3. "MIPS rating" – not often used. MIPS stands for "Million Instructions Per Second".

$$\text{MIPS} = \frac{\text{clock rate}}{\text{CPI}}$$

This formula is not obvious until we look at the units we need. Usually, the clock rate will be known and the (average) CPI can be computed.

4. "is faster than" – Sometimes we just want to say that machine A is x times as fast as machine B when running some program. The factor "x" is:

$$\frac{\text{slower time}}{\text{faster time}}$$

5. Throughput – this means the amount of work we can do in a given amount of time (like one second) – the rate at which jobs can be done.

$$\text{throughput} = \frac{\text{\# machines}}{\text{execution time}}$$

This formula assumes that you have a number of identical machines (so that the execution time is the same on each). If the machines are not the same, or for some reason the execution time will differ, you would need to calculate the throughput for each machine and add everything up at the end.

Note that the throughput for 1 machine means how often (how many times per second or minute) you can do a job on that machine.