

CPU performance, depending on User  
 Remember: performance of a computer only determined by User CPU time.

$$\Rightarrow \text{User CPU performance} = \frac{1}{\text{User CPU Time}}$$

$$\rightarrow \text{User CPU time} = \text{CPU clock cycles} \times \text{cycle Time}$$

$$= \frac{\text{CPU clock cycles}}{\text{clock Rate}}$$

User CPU time = cycles x cycle Time  
 = cycles / clock Rate.

$$\text{cycle time} = \frac{1}{\text{Rate}}$$

$$\text{Rate} = \frac{1}{\text{cycle time}}$$

Determined by the hardware.

$$\text{clock cycles} = \text{Instruction count} \times \text{cycles per Instruction}$$

→ cycles per Instruction: Determined by the Hardware.

Then weighted CPU Average:

$$\text{CPI} = \frac{\text{clock cycles}}{\text{Instruction count}} = \sum_{i=1}^n \left( \text{CPI}_i \times \frac{\text{IC}_i}{\text{IC}_{\text{total}}} \right)$$

Remember

$$\text{cycles} = \text{IC}_{\text{total}} \times \text{CPI}_{\text{average}}$$

or →

$$\text{cycles} = \sum_{i=1}^n (\text{CPI}_i \times \text{Instruction count})$$
 for each instruction type.

→ Instruction count: Determined by - program  
 - ISA  
 - compiler.