

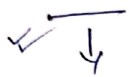
## Cache Processor :-

### Performance Measures :->

- \* In the context PM CO, PM refers to how efficiently a computer or CPU executes tasks, specifically programs or set of Instruction
- \* Performance is critical coz it directly impacts the speed and effectiveness of a system when running apps.

### Performance Metrics

#### 1. CPI Clock Per Instruction



The average ~~number~~ no. of clock cycles needed to execute one instruction.

$$CPI = \frac{\text{Total Cycles}}{\text{Total Instruction}}$$

$$\text{Total Cycles} = \text{Clock Rate} \times \text{Execution}$$

∴ Lower the CPI better the performance as fewer cycles are needed for instruction.

#### 2. Instruction Per Cycle (IPC)

↓  
The no. of instruction executed per clock cycle.

$$IPC = \frac{\text{Total Instruction}}{\text{Total Cycles}}$$

\* Higher IPC means better utilization of each clock cycle.

### 3. Execution Time (CPU time).

Total time the CPU spends processing a particular task.

$$\text{CPU time} = \text{Instruction Count} \times \text{CPI} \times \text{Clock Cycle time}.$$

or

$$\text{CPU time} = \frac{\text{Instruction Count} \times \text{CPI}}{\text{Clock Rate}}.$$

\* Shorter execution time indicates better performance.

### 4. Speedup

↳ A measure of the performance gain achieved by a system improvement.

$$\text{Speedup} = \frac{\text{Execution Time of baseline}}{\text{Execution time of Improved System}}.$$

### 5. Efficiency

↳ A measure of how well the System uses its resources, often compared to an ideal system.

$$\text{Efficiency} = \frac{\text{Actual Speedup}}{\left( \frac{\text{No. of Processors}}{\text{Theoretical Max. Speedup}} \right) \cdot \text{Theoretical Max. Sp.}}$$

\* Higher efficiency using resources very well.