Scalar Processor :-

Performance Measures :->

* In the context of 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 applns.

Performance Metrics

1. CPI Clock Per Instruction
   ↓
   The average no. of clock cycles needed to execute one instruction.

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

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

Total Cycles = Clock Rate × Executions

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.

CPU time = Instruction Count × CPI × 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.

$$\text{Efficiency} = \frac{\text{Actual Speedup}}{(\text{No. of processors}, \text{Theoritical Max. Speedup})}.$$

Theoritical Max. Sp.

※ Higher efficiency using is resources very well.