Performance Equations

- $CPUtime = CPUClockCyclesForAProgram * ClockCycleTime$
- $CPUtime = \frac{CPUClockCyclesForTheProgram}{ClockRate}$
- $CycleTime = \frac{1}{ClockRate}$
- $Performace = \frac{1}{ExecutionTime}$
- $CPI = \frac{CPUTime*ClockRate}{InstructionCount}$
- $CPUClockCycles = InstructionCount * AverageClockCyclesPerInstruction$
- $CPUTime = InstrcutionCount * CPI * ClockCycleTime$
- $CPUTime = \frac{InstructionCount*CPI}{ClockRate}$

Components of performance	Units of measure
CPU execution time for a program	Seconds for the program to execute
Instruction count	Instructions executed for the program
Clock cycles per instruction (CPI)	Average number of clock cycles per instruction
Clock cycle time	Seconds per clock cycle

How can you optimize?

Hardware or software component	Affects What?	How
algorithm	instruction count and possibly CPI	algorithm determines instruction count. Data types affect CPI.
Programming language	Instruction count, CPI	Programming language determines the instruction count and language features affect CPI
Compiler	Instruction count, CPI	The compiler determines the translation of language instructions into computer instructions.
Instruction Set Architecture	Instruction count, clock rate, CPI	Affects the instructions needed for a function, the cost of cycles for each instruction and the clock rate of the processor.