Exercise 8.4:

CPU X runs a program/code sequence which consists of 100 instructions. Calculate and fill in the table:

(a) The CPI for each instruction class given below.

(b) The execution time for each instruction class, given a clock cycle time is **0.2 miliseconds**.

(c) The CPU X's execution time.

(d) The CPU X's clock rate (hz).

Instruction	Instructions count	Clock Cycles	(a) CPI	(b) Execution time
A	20	3	**3/20 = 0.15**	**0.6ms**
B	25	1	**1/25 = 0.04**	**0.2ms**
C	10	2	**2/10 = 0.2**	**0.4ms**
D	30	2	**2/30 = 0.067**	**0.4ms**
E	10	3	**3/10 = 0.3**	**0.6ms**
F	5	4	**4/5 = 0.8**	**0.8ms**

a) CPI = Clock cycles / Instruction count

Example CPI (Instr A) = 3 / 20 = **0.15**

...

b) Can use either one of the available equations:

Eq 1 is easier & simpler.

Eq 1 : Exec. time (Instr A) = [Instr count x Clock cycles] x Clock cycle time

= **3** x 0.2ms = **0.6ms**

3 is clock cycles for 20 instruction.

Eq 2 : Exec. time (Instr A) = Instr count x CPI x Clock cycle time

= 20 x 0.15 x 0.2ms = **0.6ms**

....

c) CPU X's Execution Time = **Total of Execution Time for all Instructions =** (.6+.2+.4+.4+.6+.8)ms = **3ms**

d) CPU X's Clock rate = Total of Clock Cycles / Total of Execution Time

= (3+1+2+2+3+4)/ 3ms

= 15 / (3 x 10^{-3}) = (15 x 10^{0}) / (3 x 10^{-3}) = 5 x $10^{0 - (-3)}$

= 5 x 10^{3} = 5 KHz