

Com S 321**Activity 3**

1. Suppose that a machine M1 costs \$10,000 and a machine M2 costs \$15,000. If you ran a program on machine M1 it takes 10 secs to complete and the same program on M2 takes 5 secs to complete. However, you may not want to spend \$5,000 extra on machine M2 to get a gain of 5 seconds for just a single run of the program. But if you needed to run the program a large number of times and were concerned with the cost/performance ratio over thousands of runs instead of a single run, which machine would you buy in large quantities and why?

2. Machines M1 and M2 have a clock rate of 850 MHz. Find the peak MIPS rating for M1 and M2, given that the average number of clock cycles for each instruction class on M1 and M2 is as follows:

Machine M1		Machine M2	
Class	CPI for this class	Class	CPI for this class
A	1	A	2
B	3	B	2
C	4	C	4
D	5	D	4

3. Consider a machine with a MIPS rating of 400. If the Instruction Count of a program executing on this machine is 1,875 million, what is its execution time?

4. Consider a program P with the following mix of operations: 20% Floating point multiplications, 15% Floating point adds, 5% Floating point divides, and 60% integer instructions. This program is executed on two machines – one with floating point hardware (MFP) and one with no floating point hardware (MNFP). Both machines have a clock rate of 600 MHz. On the MNFP machine, the floating point instructions are emulated using integer instructions, each integer instruction taking 2 clock cycles. On MFP, the floating point operations require the following number of cycles:

Floating point Multiply	8 cycles
Floating point Add	4 cycles
Floating point Divide	25 cycles
Integer instructions	2 cycles

On MNFP, the number of integer instructions needed to implement each of the floating point operations is as follows:

Floating point Multiply	30 integer instructions
Floating point Add	15 integer instructions
Floating point Divide	50 integer instructions

(a) Find the CPI and the MIPS rating for both MFP and MNFP.

(b) If the MFP machine needs 300 million instructions for the program P, how many integer instructions are needed on the MNFP machine for the same program P?

(c) What is the execution time in seconds for program P on MFP and MNFP, assuming the instruction count from part (b)?