CSE 560 – Practice Problem Set 1

1. Of the three factors in the fundamental performance equation:

$$\textbf{Execution Time} = \frac{\textbf{instructions}}{\textbf{program}} \times \frac{\textbf{seconds}}{\textbf{cycle}} \times \frac{\textbf{cycles}}{\textbf{instruction}}$$

   Which is most influenced by:

   (a) The technology
   (b) The compiler
   (c) The computer architect

2. When running an integer benchmark on a RISC machine, the average instruction mix was as follows:

Instructions	Average Frequency
Load	26%
Store	9%
Arithmetic	14%
Compare	13%
Conditional Branch	16%
Unconditional Branch	1%
Call/Return	2%
Shift	4%
Logical	9%
Misc.	6%

   The following measurements of average CPI (cycles per instruction) for individual instruction categories were made:

Instruction type	Average CPI (clock cycles)
All ALU instructions	1.0
Load-store	1.4
Conditional branches:	
Taken	2.0
Not Taken	1.5
Jumps	1.2

   Assume that 60% of the conditional branches are taken and that all instructions in the Misc. category are ALU instructions. What is the CPI of the benchmark on this RISC machine?