

COMP4300 Spring 2020
Homework Assignment 1
Due Tuesday, February 18, 11:59pm

1. Suppose that a given optimization results in an OVERALL speedup of 2 over the original design. If the optimization speeds up loads and stores, which collectively accounted for 75% of the execution time BEFORE the optimization, by what factor were loads and stores sped up by the optimization?
2. If, in problem one, the described optimization could make loads and stores take no time at all (not realistic, just for the sake of argument), what would the overall speedup to the execution time be?
3. Suppose a given server computer has a distributed file system on 3 disk drives. The distribution is for speed, not redundancy, so if any one of the three disk drives fails, the computer fails as a whole – it cannot serve any requests. Now suppose that the MTTF for each of the 3 individual disk drives is 1 year. What is the MTTF of the disk drive subsystem consisting of the three drives working together. There is no other hardware in the subsystem except the three disk drives.
4. For a particular computer, the CPI for certain types of instructions is as follows:
 - ALU operations, 1 cycle, make up 20% of dynamic (run-time) instruction count
 - Load/store operations, 5 cycles, 40% of dynamic instruction count
 - Control flow, 3 cycles, 20% of dynamic instruction count
 - All other, 2 cycles, 20% of dynamic instruction count
 - a. What is the average CPI?
 - b. Suppose there is an optimization in which the CPI of load/store is reduced to 2, but cycle time is lengthened by 10%. What is the speedup due to this optimization?