| CPSC 418 | Advanced Computer Architecture | Spring 1995 |
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# Homework 9: Due Thur 30 Mar

**Problem 1** (4 Points)

H&P 8.3

**Hint**

The key is to calculate the percentage of memory references from the CPU to the cache that result in a reference also being sent to main memory. (Review notes from lecture on memory hierarchy from before midterm.)

**Potentially helpful information:**

The cache is connected directly to the CPU. The cache communicates with main memory over the bus.

**Problem 2** (6 Points)

H&P 8.4 (Just use the **average** data for the programs in Fig C.4)

**Potentially useful information**

- Treat the data in Fig C.4 as exact, i.e. ignore instructions not listed in the table, rounding problems with averages, etc.
- Assume the Ideal CPI for the pipeline is 1, ignore all stalls except those caused by load/store instructions.
- Load and store doubles transfer two words, regular loads and stores transfer one word. But, we can detect a cache hit for a double in one cycle; we don't need to separately check each of the two words in the double word.
- This is a unified (inst + data) cache, so instruction fetch counts as a cache-read.
- The microprocessor as described in the problem has a non-pipelined Load/Store unit and *all* instructions pass through the L/S unit, regardless of whether they use it not.

  With a write-through cache, all loads and stores spend one cycle in the L/S unit on a cache hit. With a write-back cache, a load that hits in the cache will spend one cycle in the L/S unit and a store that hits will spend two cycles in the L/S unit.

  If a load/store instruction spends one cycle in the L/S unit, the pipeline does not stall. But, if an instruction spends two or more cycles in the L/S unit, the pipeline will stall.

  It takes 10 clock cycles to load a cache block from main memory.

  It takes 10 clock cycles to write a cache block from the cache to main memory.

**Problem 3** (6 Points)

H&P 8.5 (Just do the calculations for the DLX, not the VAX)

**Problem 4** (1 Points)

How much time did you spend total on this assignment?