

COMP 190-088: Systems Performance Analysis

Assignment # 1

Due on: 2/16/05

Note:

1. You're encouraged to discuss "approaches", but you **must** formulate the solution details on your own.
 2. Please typeset your homework in a font no smaller than **12 pt.**
 3. Please be clear. Writing your arguments as points rather than as long paragraphs would make it easier to read and grade.
-

1. Your company plans to host a web-server and needs your help in assessing the system hardware requirements (processor, disk, memory, and network card).

Briefly describe the system and list the following:

1. Services provided by the system
2. Performance metrics
3. System parameters
4. Workload parameters
5. Evaluation techniques to be used
6. Workload generation methodology

Justify your choices.

[10 points]

2. Make a complete list of metrics to compare
 1. Two Database Servers
 2. Two Disk Drives
 3. Two Window Systems

[10 points]

3. **Briefly** describe the intended goal and workload generation methodology used by the SPEC benchmarks for
1. CPUs (CPU2000 benchmark)
 2. Web servers (Web99 benchmark)

[15 points]

4. Consider the use of two benchmarks, I and J, to evaluate two systems, A and B. Assume that each test of a system with a benchmark results in a *pass* or *fail* verdict, where *pass* is desirable. The following table summarizes the results of several tests of the two benchmarks on the two systems.

Test	System A		System B	
	Total	Pass	Total	Pass
I	A_I	X_I	B_I	Y_I
J	A_J	X_J	B_J	Y_J

Derive conditions necessary for you to be able to use the technique of combined percentages to your advantage if you're marketing system A. [You may find it useful to first go through Section 11.5 and Derivation 11.1 in the Chapter 11 handout given to you.]

[15 points]

5. The following table shows the execution times for 5 different benchmark programs when they are executed on 3 different systems. The last column shows the number of instructions executed by each benchmark program.

Program	S_1	S_2	S_3	Number of instructions
1	33.4	28.8	28.3	1.45×10^{10}
2	19.9	22.1	25.3	7.97×10^9
3	6.5	5.3	4.7	3.11×10^9
4	84.3	75.8	80.1	3.77×10^9
5	101.1	99.4	70.2	4.56×10^{10}

- (a) Assuming that each benchmark should be equally weighted, calculate the following:
- i. The average execution time
 - ii. The average MIPS rate

- iii. The average speedup and relative change when using S_3 as the base system.
- iv. Are these average values reasonable summaries of the data presented? Why or why not?

[10 points]

- (b) Repeat the above steps when benchmark program 1 represents 40% of the expected workload, benchmark program 2 represents 35%, and programs 3, 4, and 5 represent 15%, 5%, and 5%, respectively.

[10 points]

- (c) Determine the coefficient of variation of the execution times for each of the 3 systems.

[10 points]