In More Depth: Amdahl's Law

Amdahl's law is sometimes given in another form that yields the speedup. *Speedup* is the measure of how a computer performs after some enhancement relative to how it performed previously. Thus, if some feature yields a speedup ratio of 2, performance with the enhancement is twice what it was before the enhancement. Hence, we can write

$$\text{Speedup} = \frac{\text{Performance after improvement}}{\text{Performance before improvement}}$$

$$= \frac{\text{Execution time before improvement}}{\text{Execution time after improvement}}$$

The earlier version of Amdahl's law was given as

$$\text{Execution time after improvement} = \frac{\text{Execution time affected by improvement}}{\text{Amount of improvement}} + \text{Execution time unaffected}$$

4.22 [5] <§4.3> You are going to enhance a computer, and there are two possible improvements: either make multiply instructions run four times faster than before, or make memory access instructions run two times faster than before. You repeatedly run a program that takes 100 seconds to execute. Of this time, 20% is used for multiplication, 50% for memory access instructions, and 30% for other tasks. What will the speedup be if you improve only multiplication? What will the speedup be if you improve only memory access? What will the speedup be if both improvements are made?