COA Formulas (Chapter 2)

1. Amdhal's Law

$$\text{Speedup} = \frac{\text{Time to execute program on a single processor}}{\text{Time to execute program on } N \text{ parallel processors}} = \frac{T(1-f)+Tf}{T(1-f)+\frac{Tf}{N}} = \frac{1}{(1-f)+\frac{f}{N}} \qquad \text{Speedup} = \frac{1}{(1-f)+\frac{f}{SU_f}}$$

2. Little's Law: L = λ W
3. Instruction Execution Rate: τ = 1/ f
4. CPI:

$$\text{CPI} = \frac{\sum_{i=1}^{n}(CPI_i \times I_i)}{I_c}$$

5. Processor time T= I c × CPI × τ , CPI=[p + (m×k)]
6. MIPS Rate:

$$\frac{I_c}{T \times 10^6} = \frac{f}{CPI \times 10^6} \quad \text{OR} \quad \frac{Number\ of\ ececuted\ floating-point\ operations\ in\ a\ program}{Execution\ time \times 10^6}$$

7.

$$AM = \frac{1}{n}\sum_{i=1}^{n} R_i = \frac{1}{n}\sum_{i=1}^{n} \frac{Z}{t_i} = \frac{Z}{n}\sum_{i=1}^{n} \frac{1}{t_i}$$

$$GM = \sqrt[n]{x_1 \times .... \times x_n} = \left(\prod_{i=1}^{n} x_i\right)^{1/n} = e^{\left(\frac{1}{n}\sum_{i=1}^{n} \ln(x_i)\right)}$$

$$HM = \frac{n}{\left(\frac{1}{x_1}\right) + ... + \left(\frac{1}{x_n}\right)} = \frac{n}{\sum_{i=1}^{n}\left(\frac{1}{x_i}\right)}$$

$$FM = f^{-1}\left(\frac{f(x_1 + ... + f(x_n))}{n}\right) = f^{-1}\left(\frac{1}{n}\sum_{i=1}^{n} f(x_i)\right)$$