

CpE 313 – Fall 2004
Quiz 01

Assume that the engineers at MBI Computers have made the following measurements for their existing design of ReWop Computer.

Frequency of graphics instructions = 20%

Average CPI of graphics instructions = 5

Average CPI of non-graphics instructions = 1.25

Frequency of square root instruction (a type of graphics instruction) = 5%

Average CPI of square root instruction = 40

- (a) One design team argues that it can build a new square root unit that can reduce the average CPI for all square root operations to 4.
- (b) Another team argues that it can build a new graphics engine that will reduce the average CPI of all graphics operations to 2.5.

Both teams have demanded identical resources to do their jobs. Which project would you approve as a manager?

$$CPI_{av} = 0.20(5) + 0.80(1.25) = 1 + 1 = 2$$

$$\begin{aligned} CPI_a &= CPI_{av} - CPI_{reduced\ a} \\ &= 2 - 0.05(40 - 4) \\ &= 2 - 1.8 = 0.2 \end{aligned}$$

$$\begin{aligned} CPI_b &= CPI_{av} - CPI_{reduced\ b} \\ &= 2 - 0.2(5 - 2.5) \\ &= 2 - 0.5 \\ &= 1.5 \end{aligned}$$

$$\begin{aligned} Speedup_a &= \frac{CPI_{old} \times \cancel{1/C} \times \cancel{Clock/Cycle}}{CPI_a \times \cancel{1/C} \times \cancel{Clock/Cycle}} \\ &= \frac{2}{0.2} = 10 \end{aligned}$$

$$\begin{aligned} Speedup_b &= \frac{CPI_{old} \times \cancel{1/C} \times \cancel{Clock/Cycle}}{CPI_b \times \cancel{1/C} \times \cancel{Clock/Cycle}} \\ &= \frac{2}{1.5} = 1.3\bar{3} \end{aligned}$$

* Go for (a), reduce average CPI for all square root instructions to 4.