

Problem Set 1

Joe Puccio

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Exercise 1.3

1.3.1) P2

1.3.2) P1: 20 billion cycles, 13.3 billion instructions. P2: 15 billion cycles, 15 billion instructions. P3: 30 billion cycles, 12 billion instructions.

1.3.3) Must increase by 58%.

1.3.4) P1: 1.42 IPC. P2: 2 IPC. P3: 3.33 IPC.

1.3.5) 2.14 GHz

1.3.6) 1.66 GHz

Exercise 1.4

1.4.1) $(100,000 + 400,000 + 1,500,000 + 800,000) / 1.5 \text{ bil} \text{ } \not\leq (200,000 + 400,000 + 1,000,000 + 400,000) / 2 \text{ bil}$. So P2 is faster.

1.4.2) P1: 2.8. P2: 2.

1.4.3) P1: 2.8 billion. P2: 2 billion.

1.4.4) $500 + 5 \cdot (50 + 100) + 2 \cdot (50) = 1350 \text{ cycles} / 2 \text{ GHz} = 0.000000675 \text{ seconds}$.

1.4.5) $1350 / 700 = 1.9285$.

1.4.6) $1100 / 1350 \Rightarrow 22\% \text{ faster}$. $\text{CPI} = 1100 / 650 = 1.6923$

Exercise 1.5

1.5.1) a) P1: 1 billion instructions per second. P2: 750 million instructions per second. b) P1: 1 billion instructions per second. P2: 1.5 billion instructions per second.

1.5.2) a) P2 is faster. 32% faster. b) P2 is faster. 7% faster.

1.5.3) a) P2 is faster. 33% faster. b) P2 is faster. 3% faster.

1.5.4) a) $1000 + 4000 + 1000 + 150 / 3 \text{ GHz} = 0.00000205$. b) 0.00000193333333 .

1.5.5) a) $1000 + 800 + 200 + 150 / 3 \text{ GHz} = 0.00000071666667$. b) 0.00000086666667 .

1.5.6) a) 30% b) 40%.

Exercise 1.6

1.6.1) a) average of 1 CPI for compiler A, average of 1.166 CPI for compiler B. b) average of 0.8 CPI for compiler A, average of .58 for compiler B.

1.6.2) a) B is 40% faster. b) A is 15% faster.

1.6.3) a) speedup over compiler A is 42%. speedup over compiler B is 100%. b) 21% and 5%.

Exercise 1.8

1.8.1) Increased by 3%.

1.8.2) P2 has increased by 15%

1.8.3) $V = 9.4$

Exercise 1.15

1.15.1) a) 3.5 % b) 4.8%

1.15.2) a) 8.5% b) 7.6%

1.15.3) a) No. b) No.

1.15.4) a) Not possible b) Not possible.

1.15.5) a) Reduce by 80%. b) Reduce it by 80%.

1.15.6) a) $1536 + 3584 + 358.4 = 5478$ and original was 8192 so improved by 50%. b) $192 + 448 + 44.8 = 684.8$ and original was 1024 so also 50%.