HW1

1. a.) $P1 = \frac{3\times10^9}{1.5} = 2\times10^9$ istr/sec

$P2 = 2.5\times10^9$ inst/sec

$P3 = \frac{4\times10^9}{2.2} = 1.81\times10^9$ instr/sec

The lowest (Fastest) is P3 at 1.81×10^9 instr/sec

b.) $P1 = 30\times10^9$ cycles $\rightarrow /1.5 = 20\times10^9$ instr.

$P2 = 25\times10^9$ cycles $\rightarrow /1.0 = 25\times10^9$ instr.

$P3 = 40\times10^9$ cycles $\rightarrow /2.2 = 18.18\times10^9$ instr.

c) $P1 = 1.2\times1.5 = 1.8$, $\frac{30\times10^9}{1.5} = \frac{20\times10^9\times1.8}{7} =$ 5.146Hz

$P2 = 1.2\times1.0 = 1.2$, $\frac{10\times2.5\times10^9}{1.0} = \frac{25\times10^9\times1.2}{7} =$ 4.286Hz

$P3 = 1.2\times2.2 = 2.64$, $\frac{18.18\times10^9\times2.64}{7} =$ 6.856Hz

HW 1

2. $P1 = \frac{2.6 \times 10^{-3}}{2.5}$ sec $= .00104$ sec $= 1.04$ ms

$P2 = \frac{2 \times 10^{-3}}{3}$ sec $= .00067$ sec $= .67$ ms

$\boxed{P2 > P1}$

a.) $P1 \text{ G CPI} = \frac{1.04 \times 10^{-3} \times 2.5 \times 10^{9}}{10^{6}} = \boxed{2.6}$

$P2 \text{ G CPI} = \frac{.67 \times 10^{-3} \times 3 \times 10^{9}}{10^{6}} = \boxed{2.01}$

b.) P1: 2.6×10^{6} clock cycles

P2: 2.01×10^{6} clock cycles

HW 1

3. a.) P1 exec time = $\frac{1.92 \times 10^{10} \text{ cycles}}{2 \times 10^9 \text{ cyc/sec}} = 9.6 \text{ sec}$

P2 exec time = $\frac{1.404 \times 10^{10} \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 7.02 \text{ sec}$

P4 exec time = $\frac{7.72 \times 10^9 \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 3.86 \text{ sec}$

P8 exec time = $\frac{4.5 \times 10^9 \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 2.25 \text{ sec}$

b) P1 = $\frac{21760 \times 10^6 \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 10.88 \text{ sec}$

P2 = $\frac{15908.57 \times 10^6 \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 7.95 \text{ sec}$

P4 = $\frac{8594.28 \times 10^6 \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 4.30 \text{ sec}$

P8 = $\frac{4937.08 \times 10^6 \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 2.47 \text{ sec}$

HW 1

3. c.) $\frac{7.72 \times 10^9 \text{ cyc}}{2 \times 10^9 \text{ cyc/sec}} = 3.86 \text{ sec}$

$$\frac{3.84 \times 10^9 + 1.28 \times 10^9 \times X}{2 \times 10^9} = 3.86$$

$1.92 + .64X = 1.94$

$X = 3.03$

Reduced CPI = $3.03/12 = .25 = \boxed{25\%}$

HW 1

4. a) FP = 70 − (70 × .2) = 56s

TFP = 56s + 85s + 55s + 40s = 236s

RFP = 250s − 236s = 14s

$TTR = \frac{14s}{250s} = .056 = 5.6\%$

b) 250s − (250 × .2) = 200

New time = 200 − 40 − 70 − 85 = 55

$\frac{50s}{55s} = .9 = 90\%$

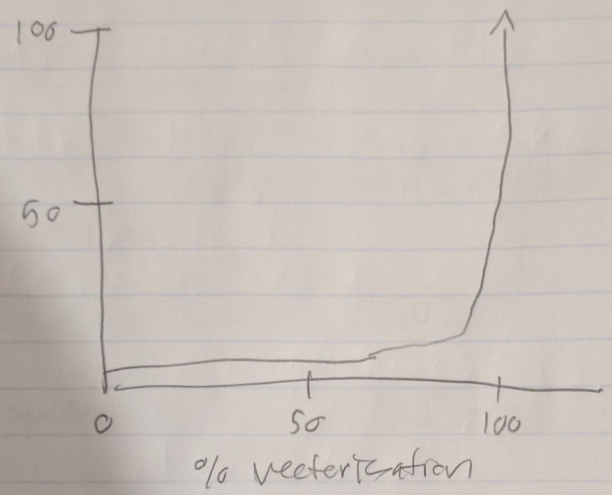
c) 250 − (250 × .2) = 200s

70 + 85 + 55 = 210s

The total time cannot be reduced by 20%, it would need to be 200s not 210s.

HW 1

5. a.) speed up $= \frac{1}{(1-\frac{f}{100}) + \frac{F}{10 \times 100}} = \frac{1}{1 - .99f}$



b.) $2 = \frac{1}{1 - 9f/1000} \Rightarrow 1 - \frac{9f}{1000} = \frac{-9f}{1000} = \frac{-1}{2}$

$f = \frac{1}{2} \times \frac{1000}{9} = 55.60\%$

To get speed up, 55.60% of vectorization is needed

Hw 1

5. a.) 55.6%

d.) $\frac{1}{1-\frac{96}{100}} = 5 \Rightarrow f = \frac{4}{5} \times \frac{100}{9} = 88.9\%$

88.9% vectorization is needed to get ½ max speedup

6. a.) 50% + 500% = 550%

Speedup = $\frac{550}{100}$ = 5.5 times

b.) $\frac{(5.5 \times 10) - 10}{(5.5 \times 10) - 5.5} = \frac{45}{49.5} = 90.9\%$

90.9% original exec time converted to fast mode.