(1)

	98
0	49
1	24
0	12
0	6
0	3
1	1
1	0

binary 01100010

Hex 6 2

01 100 010

Oct 1 4 2

---

2 1.6

class	A	B	C	D	
P1	1	2	3	3	2.5 GHz
P2	2	2	2	2	3 GHz
	10%	20%	50%	20%	

(a) CPI(P1) $1(0.1) + 2(0.2) + 3(0.5) + 3(0.2) = 2.6$

CPI (P2) $= 2(0.1) + 2(0.2) + 2(0.5) + 2(0.2) = 2.0$

(b) for P1 $2.6 \times 10^6 = 2.6 \times 10^6$

for P2 $2.0 \times 10^6 = 2 \times 10^6$

1.9

	op	l/s	branch
CPI	1	12	5
	2.56×10^9	1.28×10^9	256×10^6
	0.7P	0.7P	1

for 1 Processor

$T = \sum CPI_i \times IC_i \times T_c$ ← clock cycle

$(2.56\times10^9\times1 + 1.28\times10^9\times12 + 256\times10^6\times5) \times \frac{1}{2\times10^9}$

T = 9.6 sec

for P = T = $\sum CPI_i \times IC_i \times T_c$

IC_i → reduce 0.7P

$= \left(\frac{2.56e9\times1}{0.7P} + \frac{1.28e9\times12}{0.7P} + 256e6\times5\right) \times \frac{1}{2\times10^9}$

P	T	speedup
2	7.04	1.36
4	3.84	2.5
8	2.24	4.29

1.9.2

Arith inst doubled

p = 1	10.88 sec.
p = 2	7.95
p = 4	4.29
p = 8	2.46

1.9.3 4 processors 3.84 sec

for p = 1 $\frac{(2.56 \times 10^9 \times 1 + 1.28 \times 10^9 \times 12 + x \times 10^9 \times 5)}{2 \times 10^9} = 3.84$

$2.56 + 1.28 \times 12 + 5x = 2 \times 3.84$

x = -ve number NO WAY WE CAN DO THAT

1.11.1 SPEC

$IC = 2.389 \times 10^{12}$ instructions

$T = 750$ sec

$T_{ref} = 9650$ sec

$T = IC \times CPI \times T_c$

$750 = 2.38 \times 10^{12} \times CPI \times 0.33 \times 10^{-9}$

$CPI = 0.946$

1.11.3 Since CPI, T_c constant

increases by 10%

1.11.4

new T = old T × 1.1 × 1.05

= 1.155

1.12.1

P1	4 GHz	CPI = 0.9	IC = 5×10^9 inst.
P2	3 GHz	0.75	1×10^9

$\text{Time}(P1) = IC \times CPI \times T_c = \frac{IC \times CPI}{\text{Clockrate}}$

$= \frac{5 \times 10^9 \times 0.9}{4 \times 10^9} = 1.125 \text{ sec}$

$\text{Time}(P2) = \frac{10^9 \times 0.75}{3 \times 10^9} = 0.25 \text{ sec}$

<u>NOT TRUE</u>

1.12.2 $T = \frac{IC_1 \times CPI_1}{\text{Clock}_1} = \frac{IC_2 \times CPI_2}{\text{Clock}_2}$

$\frac{10^9 \times 0.9}{4 \times 10^9} = \frac{IC_2 \times 0.75}{3 \times 10^9}$

$IC_2 = 0.9 \times 10^9$ instructions

1.12.3 MIPS: million instructions Per Second

f ~~MIPS~~: P1 5×10^9 in 1.125 sec: 4444 MIPS

P2 1×10^9 in 0.25 sec: 4000 MIPS

in general $\text{MIPS} = \frac{\text{Clockrate} \times 10^{-6}}{CPI}$