Bradley Grosc

1) P1 = 1·.10 + 3·.20 + 4·.30 + 2·.40 =
.10 + .60 + .120 + .80 = 2.7 Global CPI

P2 = 4·.10 + 5·.20 + 6·.30 + 2·.40
.40 + 1 + 1.8 + .8 = 4 Global CPI

a) P1 = $\frac{3 \cdot 10^9}{2.7}$ = $1.11 \cdot 10^9$ instruction per second

P2 = $\frac{4 \cdot 10^9}{4}$ = $1.00 \cdot 10^9$ instructions per second

Therefor P1 is faster

b) P1 = 2.7 CPI
P2 = 4 CPI

c) $\frac{10^4}{1.11 \cdot 10^9}$ = 9E-6 seconds for P1

$\frac{10^4}{1 \cdot 10^9}$ = 1E-5 seconds for P2

2a) 500(1) + 150(5) + 100(5) + 100(2) = 500 + 750 + 500 + 200 = 1950 Cycles

$\frac{1950}{2E9}$ = 9.75E-7 seconds

b) $\frac{1950}{500+150+100+100}$ = 2.294 CPI

c) 500(1) + 150(5) + 50(5) + 100(2) = 1700 cycles

$\frac{1700}{2E9}$ = 8.5E-7 $\frac{8.5E-7}{9.75E-7}$ = 13% speed up

$\frac{1700}{500+150+50+100}$ = 2.125 CPI

d) 250(1) + 75(5) + 100(5) + 100(2) = 1325 cycles

Time: $\frac{1325}{2E9}$ = 6.625E-7 seconds $\frac{6.625E-7}{9.75E-7}$ = 32% speed up

$\frac{1325}{250+75+100+100}$ = 2.524 CPI

3)

leaf_procedure:

```
add  $t0, $a0, $a1
addi $t1, $a0, -2
add  $t0, $t0, $t1
move $v0, $t0
```

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4) $-27.0625$

= Sign = 1

$.0625 \cdot 2 = .125$
$.125 \cdot 2 = .25$
$.25 \cdot 2 = .5$
$.5 \cdot 2 = 1$

$2^4 < 27 \leq 2^5$

So $4+127=131$

| 1 | 10000011 | 10110000000000000000000 |
|---|---|---|

$27.0625 - 16 = 11.0625$

$\frac{1}{128}\ \frac{0}{64}\ \frac{0}{32}\ \frac{0}{16}\ \frac{0}{8}\ \frac{0}{4}\ \frac{1}{2}\ \frac{1}{1}$

$\frac{1}{8}\ \frac{0}{4}\ \frac{1}{2}\ \frac{1}{1}\ \frac{0}{.5}\ \frac{0}{.25}\ \frac{0}{.125}\ \frac{1}{.0625}$

10000011

Exp

1100 0001 1101 1000 1000 0000 0000 0000

C 1 D 8 8 0 0 0

**0xC1D88000**

5) 0xC0A80000

C 0 A 8 0 0 0 0

1100 0000 1010 1000 0000 0000 0000 0000$_2$

1 | 10000001$_2$ | 01010000000000000000000

Sign | 129 | $\frac{1}{4} + \frac{1}{16} = \frac{5}{16} = .3125$

So negative

$-1\ (1.3125) \cdot 2^{129-127} = \boxed{-5.25}$