

Soluções Aula prática 2

Solução 1.5

- a. O P2 tem a performance mais alta

$$\text{performance of P1 (instructions/sec)} = 3 \times 10^9 / 1.5 = 2 \times 10^9$$

$$\text{performance of P2 (instructions/sec)} = 2.5 \times 10^9 / 1.0 = 2.5 \times 10^9$$

$$\text{performance of P3 (instructions/sec)} = 4 \times 10^9 / 2.2 = 1.8 \times 10^9$$

- b. No cycles = time x clock rate

$$\text{cycles(P1)} = 10 \times 3 \times 10^9 = 30 \times 10^9 \text{ s}$$

$$\text{cycles(P2)} = 10 \times 2.5 \times 10^9 = 25 \times 10^9 \text{ s}$$

$$\text{cycles(P3)} = 10 \times 4 \times 10^9 = 40 \times 10^9 \text{ s}$$

$$\text{No. instructions(P1)} = 30 \times 10^9 / 1.5 = 20 \times 10^9$$

$$\text{No. instructions(P2)} = 25 \times 10^9 / 1 = 25 \times 10^9$$

$$\text{No. instructions(P3)} = 40 \times 10^9 / 2.2 = 18.18 \times 10^9$$

- c. $\text{CPI}_{\text{new}} = \text{CPI}_{\text{old}} \times 1.2$, then $\text{CPI(P1)} = 1.8$, $\text{CPI(P2)} = 1.2$, $\text{CPI(P3)} = 2.6$

$$f = \text{No. instr.} \times \text{CPI/time, then}$$

$$f(\text{P1}) = 20 \times 10^9 \times 1.8 / 7 = 5.14 \text{ GHz}$$

$$f(\text{P2}) = 25 \times 10^9 \times 1.2 / 7 = 4.28 \text{ GHz}$$

$$f(\text{P3}) = 18.18 \times 10^9 \times 2.6 / 7 = 6.75 \text{ GHz}$$

Solução 1.6

- a. $\text{CPI} = \text{time} \times \text{clock rate} / \text{No. Instr.}$

Class A: 10^5 instr.

Class B: 2×10^5 instr.

Class C: 5×10^5 instr.

Class D: 2×10^5 instr.

$$\text{Time} = \text{No. instr.} \times \text{CPI/clock rate}$$

$$\text{Total time P1} = (10^5 \times 2 + 2 \times 10^5 \times 2 + 5 \times 10^5 \times 3 + 2 \times 10^5 \times 3) / (2.5 \times 10^9) = 10.4 \times 10^{-4} \text{ s}$$

$$\text{Total time P2} = (10^5 \times 2 + 2 \times 10^5 \times 2 + 5 \times 10^5 \times 2 + 2 \times 10^5 \times 2) / (3 \times 10^9) = 6.66 \times 10^{-4} \text{ s}$$

$$\text{CPI(P1)} = 10.4 \times 10^{-4} \times 2.5 \times 10^9 / 10^6 = 2.6$$

$$\text{CPI(P2)} = 6.66 \times 10^{-4} \times 3 \times 10^9 / 10^6 = 2.0$$

- b. $\text{clock cycles(P1)} = 10^5 \times 1 + 2 \times 10^5 \times 2 + 5 \times 10^5 \times 3 + 2 \times 10^5 \times 3$
 $= 26 \times 10^5$
 $\text{clock cycles(P2)} = 10^5 \times 2 + 2 \times 10^5 \times 2 + 5 \times 10^5 \times 2 + 2 \times 10^5 \times 2$
 $= 20 \times 10^5$

Solução 1.7

a. $CPI = T_{exec} \times f / \text{No. instr.}$

Compiler A CPI = 1.1

Compiler B CPI = 1.25

b. $f_B/f_A = (\text{No. instr.}(B) \times CPI(B)) / (\text{No. instr.}(A) \times CPI(A)) = 1.37$

c. $T_A/T_{new} = 1.67$
 $T_B/T_{new} = 2.27$

Solução 1.9

1.9.1

p	# arith inst.	# L/S inst.	# branch inst.	cycles	ex. time	speedup
1	2.56E9	1.28E9	2.56E8	7.94E10	39.7	1
2	1.83E9	9.14E8	2.56E8	5.67E10	28.3	1.4
4	9.12E8	4.57E8	2.56E8	2.83E10	14.2	2.8
8	4.57E8	2.29E8	2.56E8	1.42E10	7.10	5.6