

1.2 1.5 1.6 1.7 1.13

3.7 3.20 3.26 3.27 3.32

2.4 2.8 2.12 2.14 2.17 2.22 2.24 2.29

1.5 见福昕

1.6	clock rate	CPI			
		Class A	B	C	D
P1	2.5GHz	1	2	3	3
P2	3GHz	2	2	2	2

a. # instructions: 1.0×10^6

10% A 20% B 50% C 20% D

$$P1: CPI: 1 \times 0.1 + 2 \times 0.2 + 3 \times 0.5 + 3 \times 0.2 = 0.1 + 0.4 + 1.5 + 0.6 = 2.6 \quad \checkmark$$

$$P2: CPI: 2 \quad \checkmark$$

$$P1: cycle: \frac{1}{2.5} = 0.4$$

$$P2: cycle: \frac{1}{3}$$

$$Time: P1: 2.6 \times 0.4 = \frac{12}{5} \times \frac{2}{5} = \frac{24}{25} \quad \checkmark$$

$$P2: 2 \times \frac{1}{3} = \frac{2}{3} \quad \checkmark$$

- 共 10^6 instructions

b. P1 clock cycles

$$10^6 \times (1 \times \frac{1}{10} + 2 \times \frac{2}{10} + 3 \times \frac{5}{10} + 3 \times \frac{2}{10})$$

P2 clock cycles

$$10^6 \times (2 \times \frac{1}{10} + 2 \times \frac{2}{10} + 2 \times \frac{5}{10} + 2 \times \frac{2}{10})$$

1.7 A: # instruction 10^9
execution time 1.1sB: # instruction 1.2×10^9
execution time 1.5s

a. clock cycle: 1ns

$$A: 10^9 \cdot CPI \cdot 1 \times 10^{-9} = 1.1 \quad \therefore CPI = 1.1 \quad \checkmark$$

$$B: 1.2 \times 10^9 \cdot CPI \cdot 1 \times 10^{-9} = 1.5 \quad \therefore CPI = \frac{1.5}{1.2} = \frac{5}{4} = 1.25 \quad \checkmark$$

b. execution time: the same

$$\frac{10^9 \cdot CPI_A}{clock\ rate_A} = \frac{1.2 \times 10^9 \cdot CPI_B}{clock\ rate_B}$$

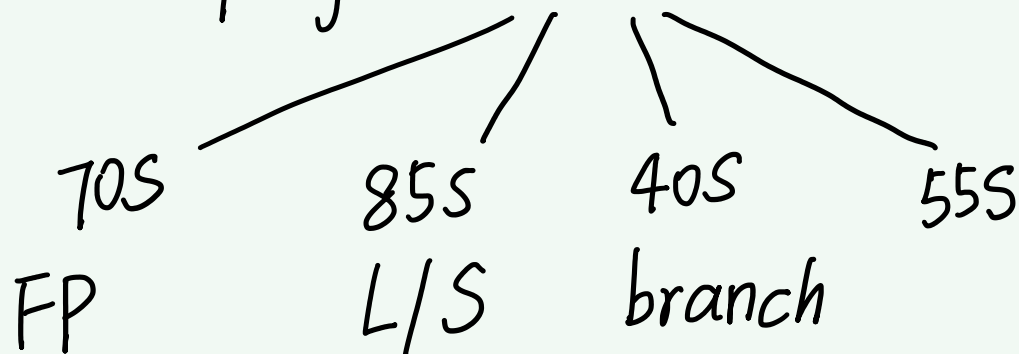
$$\therefore \frac{clock\ rate_A}{clock\ rate_B} = \frac{10^9 \cdot CPI_A}{1.2 \times 10^9 \cdot CPI_B} = \frac{1.1}{1.5} = \frac{11}{15} \quad \checkmark$$

$$\frac{10^9 \cdot CPI_A \cdot clock\ cycle}{1.2 \times 10^9 \cdot CPI_B \cdot clock\ cycle} = \frac{1.1}{1.5}$$

$$c. \frac{A}{C} = \frac{10^9 \cdot CPI_A \cdot clock\ cycle}{6 \times 10^8 \cdot 1.1 \cdot clock\ cycle} = \frac{10}{6} = \frac{5}{3} \quad \checkmark$$

$$\frac{B}{C} = \frac{1.2 \times 10^9 \cdot CPI_B \cdot clock\ cycle}{6 \times 10^8 \cdot 1.1 \cdot clock\ cycle} = \frac{12 \times 1.25}{6 \times 1.1} = \frac{2.5}{1.1} = \frac{25}{11} \quad \checkmark$$

1.13 run a program 250s



$$1. FP \downarrow 20\% \quad 70 \times 0.2 = 14$$

$$\frac{14}{250} = 5.6\% \quad \checkmark$$

$$2. 250 \times 20\% = 50$$

$$70 + 85 + 40 = 195$$

$$INT: 250 - 195 = 55 \quad \checkmark$$

$$\frac{50}{55} = \frac{10}{11}$$

$$3. 50 > 40 \quad no \quad \checkmark$$