9.11 Week 1.

1. $T_A = \frac{1}{f_A} = \frac{1}{8MHz} = 0.125\ \mu s$

$T_B = \frac{1}{f_B} = \frac{1}{3GHz} \approx 0.33\ ns$

2. Avg. CPI 1 $= \frac{3+2+5+3}{10} = 1.3$

Avg. CPI 2 $= \frac{2+8+1+9}{10} = 2$

∴ sequence 1 更快

3. A的时钟周期数 $= 100 \times 5GHz = 5\times10^{11}$

B的时钟周期数 $= 10^{12}$

$f_B = \frac{10^{12}}{20} = 50GHz.$

4. ① $MIPS_A = \frac{10^{-6}}{5\times10^{-10}\times4} = 500$

$MIPS_B = \frac{10^{-6}}{2\times10^{-10}\times5} = 1000$

∴ B的MIP更高. 相同ISA的情况下. B快

② $\frac{MIPS_B}{MIPS_A} = 2$

∴ B 比 A 快 2 倍

③ $f_B = \frac{1}{T_B} = \frac{1}{2\times10^{-9}}\ Hz = 5\ GHz$

5. P_1 3 GHz 1.5

P_2 2.5 GHz 1

P_3 4 GHz 2.2

a. $MIPS_{P_1} = \frac{3\times10^9\times10^{-6}}{1.5} = 2\times10^3$

$MIPS_{P_2} = \frac{2.5\times10^9\times10^{-6}}{1} = 2.5\times10^3$

$MIPS_{P_3} = \frac{4\times10^9\times10^{-6}}{2.2} \approx 1.81\times10^3$

∴ P_2 的性能更高.

b. 周期数 $p_1 = 10s \times 3GHz = 30G$

$p_2 = 10s \times 2.5GHz = 25G$

$p_3 = 10s \times 4GHz = 40G$

指令数 $p_1 = \frac{30G}{1.5} = 20G$

$p_2 = \frac{25G}{1} = 25G$

$p_3 = \frac{40G}{2.2} \approx 18.18G$

C 设操作指令数为 x.

$$t = \frac{x \cdot CPI}{f}$$

原 P_1 $t_1 = \frac{x \cdot 1.5}{3 \times 10^9}$ 现 0.7 $t_1 = \frac{x \cdot 1.5 \times 1.2}{x}$

求得 $x_1 \approx 5.14GHz$

同理 $x_2 = \frac{12}{7} \times 2.5 \approx 4.28GHz$

$x_3 = \frac{12}{7} \times 2.2 \approx 3.76GHz$

6. ① $avg.CPI_1 = \frac{0.1\times10^6 + 0.2\times10^6\times2 + 0.5\times10^6\times3 + 0.2\times10^6\times3}{10^6}$

$= 2.6$

$avg.CPI_2 = \frac{0.1\times10^6\times2 + 0.2\times10^6\times2 + 0.5\times10^6\times2 + 0.2\times10^6\times2}{10^6}$

$= 2.$

$MIPS1 = \frac{2.5\times10^6}{2.6\times10^6} \approx 0.96$

$MIPS2 = \frac{3\times10^6}{2\times10^6} = 1.5$

续上. P_2 的有更快.

② $t_1 = \frac{1}{f_1} = \frac{1}{2.5\times10^9 Hz} = 0.4\ ns$

$t_2 = \frac{1}{f_2} = \frac{1}{3\times10^9 Hz} = 0.33\ ns$

7.0 $avg.CPI_A = \frac{1.1\times10^9}{1\times10^9} = 1.1$

$avg.CPI_B = \frac{1.5\times10^9}{1.2\times10^9} = 1.25$

② $\frac{avg.CPI_B}{avg.CPI_A} = \frac{1.1}{1.25} = 0.88$

A的运行时间是B的0.88倍

③

$\beta \approx \frac{1}{\frac{0.6}{\frac{1.25}{1.1}} + (1-0.6)} \approx 1.08$

A : 1.