CT 01 Solution

① Given in the slide

②

	A	B
CPU Time	10 s	1·26 s
Clock Cycles	$2·85 \times 10^9$	$11·42 \times 10^9$
Clock Period	3·5 ns	0·11 ns
Clock Rate	0·28 GHz	9 GHz

B ↓↓
B ↑
B ↓
B ↑

For A,

Clock Rate = $\frac{1}{3·5 \times 10^{-9}}$

= 0·28 GHz

Clock cycles = $\frac{\text{CPU Time}}{\text{Clock P}}$

= $2·85 \times 10^9$

For B, Clock cycles = 4 × Clock Cycles$_A$

= $4 \times 2·85 \times 10^9$

= $11·42 \times 10^9$

CPU Time = $11·42 \times 10^9 \times 0·11 \times 10^{-9}$

= 1·26

③ (a)

Arith = $750 \times 1 = 750$

Load = $500 \times 5 = 2500$

Store = $250 \times 5 = 1250$

Branch = $500 \times 2 = 1000$

Σ = 5500

CPU Time = $\frac{\text{Total cycles}}{\text{Clock Rate}}$

= $\frac{5500}{2 \times 10^9} = 2·75 \times 10^{-6}$ = 2·75 μs

b)

Total Instruction count = 2000

Avg CPI = $\frac{5500}{2000}$

= 2·75

if Load ½(B) = $250 \times 5 = 1250$

Total cycles = 4250

Avg CPI = $\frac{4250}{2000} = 2·125$

CPU Time = $\frac{4250}{2 \times 10^9} = 2·125 \times 10^{-6}$

So, $\frac{P_B}{P_A} = \frac{2·75}{2·125} = 1·27$ times Spd up