$\sim(B * \sim C)$

$(\sim C * D) \vee (F * \sim C)$

$(B \vee C) \Rightarrow B \rightarrow C$

$(\sim C * D) \vee (F * \sim C)$

$(\sim C * D) \vee (\sim C * F)$

$\sim C * (D \vee F)$

$\Rightarrow \sim C$

$\Rightarrow \sim B \quad (MT)$

$\sim(N * P)$

$\sim N \vee \sim P$

$\sim M \rightarrow N$

$\sim M \rightarrow P$

$(\sim M \rightarrow N) * (\sim M \rightarrow P)$

$\sim N \vee \sim P$

$\Rightarrow \sim\sim M$

$\Rightarrow M$

$A * B \Rightarrow C$

B

$(A \rightarrow C) * B$

$(x)(P_x \rightarrow Q_x)$

$(x)(\sim R_x \rightarrow \sim Q_x)$ $\quad$ X $(P_x \rightarrow R_x)$

$P(D) \rightarrow Q(x)$

$\sim R(x) \rightarrow \sim Q(x)$

$Q(x) \vee \sim Q(x)$

$P(x) \vee R(x)$

$P(x) \rightarrow R(x)$

$\forall x\ P(x) \rightarrow R(x)$

1) $(M \vee N) \rightarrow (P * Q)$

2) N $\quad$ / P

3) $M \vee N$ (adduction, 2)

4) $P * Q$ (Modus ponens 3,1) } ※

5) P (Simp 4)

1. $(A * B) \rightarrow (C * D)$

2. A

3. B

4. $(A * B)$ Conj [2,3]

5. $(C * D)$ MP [1,4]

1. $(T \to K) * (R \to S)$
2. $S \to D$
3. $D \to T$
4. R / T
5. $R \to S$ Simp. 1
6. S MP [4,5]
7. D MP [2,6]
8. T MP [3,7]

1. $(P \to Q) * (R \to S)$
2. $\sim A \to \sim Q$ / If (APV~S)
3. $A \to \sim B$
4. B
5. $\sim\sim B$ [D.N. 4]
6. $\sim A$ [M.T. [3,5]]
7. $\sim Q$ [M.P [2,6]]
8. $P \to Q$ (Simp. 1)
9. $\sim P$ (M.T. [8,7])
10. $\sim P \vee \sim S$ [ADD 9.]

X → no mult

Z no LUI, mult 80 cycles

Processor Z ALU 12ns P X ALU 10ns

X → 30 more instructions MUL

(no. of instruction ratio) | Average time/inst

$$[1 + 0.05 \times 30 \times] \begin{pmatrix} 0.05 \times (30) \\ 0.2 \times (50) \\ 0.1 \times (40) \\ 0.45 \times (40) \\ 0.2 \times (30) \end{pmatrix} \quad \begin{matrix} 0.05 \times (960) \\ +(0.25 \times 60) \\ +(0.1 \times 48) \\ +(0.4 \times 48) \\ +0.2 \times (36) \end{matrix}$$

extra instructions

Average 98.75 ns

time of a program

94.2 ~~cycles~~ ns

OUR BASE ASSUMPTION IS THAT THE SW IMPLEMENTATION OF MUL HAS SAME INSTRUCTION DISTRIBUTION

max instructions processor x can take for mul = [27·69]
(w implement)
= 27

$(P \to Q) * (R \to S)$

1. $(X \vee \sim Y) \to Z$
2. $\sim Z$
3. $\sim(X \vee \sim Y)$ [MT 1,2]
4. $\sim X * \sim Y$ [DeM 3]
5. $\sim\sim Y$ [Simp 4]
6. Y [D.N. 5]